Town of Slaughter Beach

Coastal Vulnerability Assessment and Adaptation Options

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The Town of Slaughter Beach
Becky Craft
Tom Craft
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Marie Dalton
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Ken Lewis
Kathy Locke
Cynthia Lyons
Jim Lyons
Kathleen McFadden
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Delaware Emergency Management Agency
Art Paul
Damaris Slawik

Delaware Department of Natural Resources and Environmental Control
Kim Cole
Molly Ellwood
Drew Faulhaber
Jacob Filby
Anthony Gonzon
Cheryl Gmuer
Pat Hoffman
Colleen Holstein
Lara Jennings
Jennifer Luoma
Michael Powell
Nicole Rodi
Bob Scarborough
Drexel Siok
Kari St.Laurent
Jim Sullivan
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Michael Tholstrup
Kelly Valencik
Carl Yetter

Delaware Department of Transportation
Gene Donaldson
Ann Gravatt
Alyssa May
Jim Pappas
Todd Pryor

Delaware Sustainable Energy Utility
Ben Burnett

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Abbreviations and Acronyms

Acronym	Explanation
AE Zone	FEMA Flood Zone, within the 100-year flood limits, are defined with BFEs that reflect the combined influence of stillwater flood elevations and wave effects less than 3 feet. The AE Zone generally extends from the landward VE zone limit to the limits of the 100-year flood from coastal sources, or until it reaches the confluence with riverine flood sources. The AE Zones also depict the SFHA due to riverine flood sources, but instead of being subdivided into separate zones of differing BFEs with possible wave effects added, they represent the flood profile determined by hydrologic and hydraulic investigations and have no wave effects.
BFE	Base Flood Elevation – elevation to which floodwater is anticipated to rise during the base flood and is the regulatory requirement for the elevation or flood proofing of structures.
DCP	Delaware Coastal Programs – a cooperative program between the State (DNREC) and NOAA that helps manage Delaware's federal coastal zone and balance the use and protection of its resources.
DGS	Delaware Geological Survey – a science-based, public-service-driven State agency at the University of Delaware (UD) that conducts geologic and hydrologic research, service, and exploration.
DNREC	Delaware Department of Natural Resources and Environmental Control – State agency responsible for the State's natural resources, public health and the environment, and quality outdoor recreation.
FEMA	Federal Emergency Management Agency – Federal agency that support s citizens and first responders to ensure the building, sustaining and improving of the capability to prepare for, protect against, respond to, recover from and mitigate all hazards.
FIRM	Flood Insurance Rate Map – the official map of a community on which FEMA has delineated both the special hazard areas and the risk premium zones applicable to the community.
GIS	Geographic Information System – mapping and database software that enables the visualization, analysis, and interpretation of geographic and other data to understand relationships, patterns, and trends.

LiDAR	Light Detection And Ranging – a surveying method to determine topographic and other features using pulsed laser light from an airplane and measuring the reflected pulses with a sensor. The 2009 USGS LiDAR data used in this study was compiled to meet 15-centimeter vertical accuracy and 2-meter horizontal accuracy at a 95% confidence level, which meets or exceeds FEMA Accuracy standard for use in flood mapping and remapping work.
LiMWA	Limit of Moderate Wave Action – FEMA Flood Zone, the inland limit of the area expected to receive 1.5-foot or greater breaking waves during the 1-percent-annual-chance flood event.
MHHW	Mean Higher High Water – the average of the higher high water height measured at tide gages for each tidal day.
NAVD88	North American Vertical Datum of 1988 – the only official vertical datum in the United States and the basis for FEMA floodplain mapping.
NOAA	National Oceanic and Atmospheric Administration – a division of the U.S. Department of Commerce that focuses on the conditions of the oceans and the atmosphere.
SEU	Sustainable Energy Utility office.
SFHA	Special Flood Hazard Area – The FEMA Special Flood Hazard Area is the area where the National Flood Insurance Program's (NFIP's) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies.
SLOSH	Sea, Lake and Overland Surges from Hurricanes model – computerized numerical model developed by the National Weather Service to estimate storm surge heights resulting from hurricanes.
USACOE	United States Army Corps of Engineers.
VE Zone	FEMA Flood Zone, also known as the coastal high hazard areas. They are areas subject to high velocity water including waves; they are defined by the 1% annual chance (base) flood limits (also known as the 100-year flood) and wave effects 3 feet or greater. The hazard zone is mapped with base flood elevations (BFEs) that reflect the combined influence of stillwater flood elevations, primary frontal dunes, and wave effects 3 feet or greater.

1 Introduction

Resilient Community Partnership

DNREC Delaware Coastal Programs

Preparing for Hazards Today - Planning for Risks Tomorrow

GOAL: To help communities undertake the necessary planning to become more *resilient* to coastal hazards

1.1 Resilient Community Partnership (RCP)

Communities throughout Delaware are threatened by inland flooding, coastal storms, sea level rise, and extreme weather. To help address these challenges, DNREC's Delaware Coastal Programs (DCP) awarded a Resilient Community Partnership (RCP) grant to the Town of Slaughter Beach through a competitive process using funding from the National Oceanic and Atmospheric Administration (NOAA). The purpose of the grant is to build the capacity of the community to plan, prepare for, and readily recover from coastal hazards, thereby enhancing its long-term resilience. To that end, three specific tasks were carried out:

- A vulnerability assessment of flooding and extreme heat hazards;
- Identification and prioritization of adaptation and mitigation measures; and
- Initial planning and implementation of viable adaptation and mitigation measures.

Figure 1 Beach erosion in the Town of Slaughter Beach. Credit: Bill McSpadden

1.2 Town of Slaughter Beach Overview

Founded in 1681 and incorporated in 1931, the Town of Slaughter Beach enjoys a reputation as a quiet seaside community rich in natural resources. Once a lively summer resort town for Milford area residents, the town used to have a large waterman community and now has a mostly residential character with a full-time population of 207 people (U.S. 2010 census) and a larger, part-time population that triples during the summer months. The full-time population skews towards retirement age with only 4 full-time resident minors of school age. Approximately 310 structures exist within the community, most of which are private residences (Delaware Bayshore Communities Economic Analysis, p. 2-14). Within town, the Slaughter Beach Memorial Fire Company Station 89 provides volunteer fire and emergency services and the Delaware Bay Launch Service, Inc. assists Bay and ocean-going barges and ships with dives, towing, ship to ship lightering and first responder spill response. The Cedar Creek Marina offers boat storage, fueling, and valet services. Just outside of town limits resides several farming operations, That's Right Seafood wholesale fish and seafood business, and the DNREC DuPont Nature Center, an

Figure 2 Bay Avenue in the Town of Slaughter Beach

educational and interpretive facility featuring the area's natural resources and ecology. A locally owned, private water supply company based in town provides drinking water to property owners, however residences use septic tanks for sanitary sewer services. Publicly owned infrastructure includes a public boat ramp, beach pavilion, and a small park with sport courts. To reach Slaughter Beach, there are two access routes off of Route 1: Cedar Beach Road (Route 36) to the north and Slaughter Beach Road (Road 224) to the south. The primary residential road in town is Bay Avenue which parallels the Delaware Bay.

Geographically, Slaughter Beach is the northernmost community located in Sussex County. It is bounded by the Delaware Bay to the east and the tidally influenced back-bay marshes (Milford Neck Wildlife Area and Marvel Tract Salt Marsh) of Slaughter and Cedar Creeks to the west. The Mispillion River and the mouth of Cedar Creek are just north of town and the Prime Hook National Wildlife Refuge and State Wildlife Management Area reside immediately to the south. Its ample natural resources make it a popular destination for bird watching, fishing, and beach recreation. Most notably, Slaughter Beach is a sanctuary for horseshoe crabs, which come

ashore to spawn by the thousands in May and June each year, and residents have adopted the horseshoe crab as their official mascot. Environmental stewardship is a central part of the town's culture, with residents supporting research, monitoring and habitat restoration activities.

Figure 3 Town of Slaughter Beach's National Wildlife Federation designation as a Certified Community Wildlife Habitat

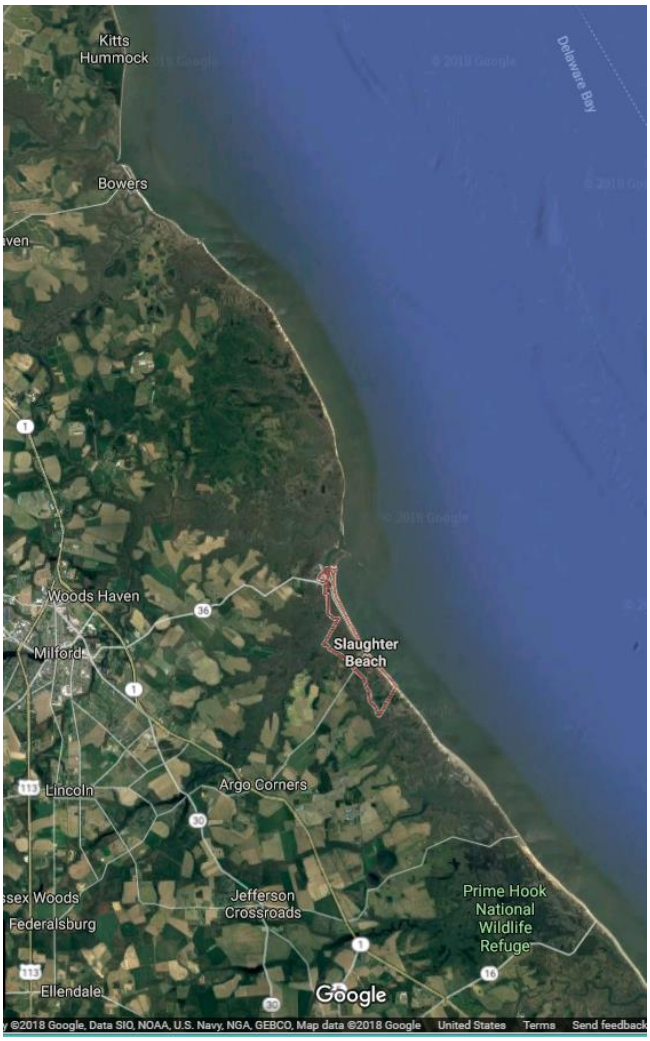


Figure 4 Town of Slaughter Beach's position along the Delaware Bay. credit: Google Maps

1.3 Methodology

The project team was comprised of staff from Delaware Coastal Programs in DNREC's Division of Climate, Coastal, and Energy, and Slaughter Beach town council representatives. Additionally, staff from DelDOT and DNREC's Division of Watershed Stewardship consulted on the project. The team agreed to the following steps during an initial kick off meeting on Monday, February 29, 2016:

1. Inventory Community Values and Assets
2. Conduct Vulnerability Assessment
3. Develop Adaptation Measures
4. Take Implementation Action

Steps to Community Resilience

From the beginning of the partnership project, the project team made it a priority to select a scope for the assessment that is both meaningful and actionable for the Town in the relative short-term. Since flooding is of real concern to property owners, given the Town's proximity to marshes and the Bay, the team chose to examine how coastal storms, storm intensity, sea level rise, and extreme tides contribute to flood risk in Slaughter Beach. The team also considered wildfires and extreme heat, ultimately adding extreme heat to the assessment based in part on public feedback and the fact that the town is already engaging with another agency on wildfire risk. A timeframe of 20 years was selected for the assessment after careful consideration of the town's demographics and capacity to act on recommendations. Twenty years is a reasonable window that avoids overburdening the planning process in small towns because it allows property owners and the public to visualize future impacts and next steps. A longer timeframe could have potentially discouraged action by appearing "too far off" and/or placed significant demands on the town's limited resources.

Public participation and outreach was another priority of the project team. Not only is public input critical to understanding local perceptions of risk and impacts, but it also builds awareness and momentum that can lead to meaningful change. However, like many coastal towns in Sussex County, the Town of Slaughter Beach has a mix of full-time and part-time property owners along with a steady stream of visitors during the warmer months. The seasonal swing in population can complicate public outreach efforts. Accordingly, the group designed a four-part public process that maximized participation during the high season (via public workshops) and used other forms of outreach and data collection during the off season (mailings, surveys, and small focus groups). The team first began with a mailing (paper and email) in April 2016 that announced the project and data collection methods. The mailing included a survey on town values which invited property owners and stakeholders to describe what makes the community a special place to live. The values survey comprises part of the baseline data collected for the vulnerability assessment and the results were tabulated in time for public vetting at the first public workshop on June 3, 2016.

Figure 5 Workshop #1 June 3. 2016

Figure 6 Workshop #1 June 3, 2016 Town of Slaughter Beach Aerial Map Tables

This workshop, held at the local fire house on a Friday evening, was timed to take advantage of the seasonal influx of property owners and visitors. The workshop gave the team another opportunity to introduce the project and it also solicited local input on coastal hazards, including the impacts and locations of flooding in town.

Following months of data collection and synthesis, a second public workshop was held on October 8, 2016 to engage the public before the shoulder season gave way to the winter months.

This workshop presented preliminary findings of the vulnerability assessment and initiated brainstorming of adaptation and mitigation recommendations that would improve the community's resilience to future hazardous events.

Figure 7 Workshop #2 October 8, 2016 Town of Slaughter Beach Inundation Map Tables

Next, the team ran small focus groups in December 2016 to vet adaptation and mitigation recommendations with local property owners. Since this part of the process fell during the quieter winter months, the team selected participants that represented a diversity of views. The team also obtained Town Council input to round out the feedback.

Finally, the project team consulted previous studies related to flood risk in the Town of Slaughter Beach, including the *Bay Beach Coastal Drainage Engineering Evaluation* from December 2014 and the *Delaware Bayshore Communities Economic Analysis of Options for Shoreline Management* from February 2014. To reduce redundancy and leverage prior research and analysis, this project adopts the recommendations of the previous studies, where applicable. This final report marks the culmination of the vulnerability assessment, public process, and adaptation plan, and was briefed to participants at a third and final workshop during the high season on July 22, 2017. Additional details about the process are described below.

2 Inventory of Community Values and Assets

In order to establish a baseline inventory for the assessment, the project team catalogued Town-owned and household infrastructure. DNREC staff obtained first floor elevations of Town residences based on the Bay Beach Coastal Drainage Engineering Evaluation report prepared for DNREC in December 2014. Staff also surveyed "critical" household infrastructure which included air conditioning units, oil/propane tanks, and septic systems. The survey was conducted by marking the locations of each type of infrastructure on an aerial map of the Town based on a windshield survey by car as well as by walking onto properties DNREC personnel were given permission to access. The locations of each type of infrastructure marked on the maps were digitized into ArcGIS and placed into categories. Using state and federal Light Detection And Ranging (LiDAR) data of land elevations, the ground elevation at each type of infrastructure unit was calculated. Some of the infrastructure such as propane tanks and septic tanks are at ground level so the ground elevation can be given can be used to assess risk; however, infrastructure such as raised air conditioners need to have their height above the referenced elevation recorded to give a true elevation for the point since they are set above ground. This information can be helpful for homeowners to gauge the vulnerability of their home investments. Please see Appendix A for the Town of Slaughter Beach Household Inventory Elevations.

Figure 8 Horseshoe Crabs Spawning at Slaughter Beach. Credit: roadsendnaturalist

The project team also obtained a baseline of the Town's values or vision for the future. In the spring of 2016, the team sent a three-page written survey to all properties in the Town of Slaughter Beach to gauge this information. More than 300 surveys were mailed, asking the head of the household to return the form by pre-stamped envelope. Community members were asked about their residency status (year-round or part-time resident, renter or property owner) as well as whether they commute to school or work. The survey then asked residents to rate how they felt about many of the town's features, amenities and public infrastructure. Residents additionally were asked an open ended question:

Figure 9 Town of Slaughter Beach Public Survey key terms from qualitative questions

> "What amenities, places, natural features, services, economic opportunities, and/or unique or cultural aspects make the community a special place to live in?"

This information provided valuable insight into the characteristics and aspects of the community that need to be maintained even if impacted by coastal hazards in the short- and long-term.

The Delaware Coastal Program (DCP) received 165 responses, a return rate of over 50%. The following key words were noted based on the number of times they were used in the surveys:

The survey results collected by the DCP were presented to Town Council members who used the information to develop a draft Community Vision Statement. The team invited residents and stakeholders to comment on the statement at the first public engagement workshop on June 3, 2016. Based on the survey results and workshop feedback, the following Community Vision Statement was completed to guide Town of Slaughter Beach's planning for the future and the Resilient Community Partnership project.

SLAUGHTER Beach DELAWARE

"Safeguarding our heritage through conservation, education, and the sharing of our abundant natural resources."

Figure 10 Town of Slaughter Beach Community Vision Statement

3 Conduct Vulnerability Assessment

3.1 Characterize Existing Hazards

In coastal Delaware, flood risk is typically a function of exposure and vulnerability to heavy precipitation events, coastal storms, sea level rise, and/or extreme tides. Exposure and vulnerability are not static, and therefore it is important to characterize risk in terms of past, present, and future conditions. To begin, the team studied historic storm climatology records which show that Delaware experiences a high rate of variability in precipitation from year to year and location to location (Delaware Climate Impact Assessment, p. 2). Heavy precipitation events can overwhelm the infiltration capacity of stormwater infrastructure and wetlands, causing flooding. The Town is susceptible to this due to its direct proximity to marshland on three sides, its flat, low elevation which impedes the flow of water away from Town, and its high water table which lies approximately 2 to 4 feet below the land surface elevation for Slaughter Beach and most of the Bay Beach communities (Bay Beach Coastal Drainage Engineering Evaluation, p. 2-2).

The team also examined FEMA's Flood Insurance Rate Maps (FIRM), which indicate the areas of high, moderate, and low flood risk based on topographic data and an analysis of past storm events. The Town is located within the 100-year flood zone which means that the town has a 1% chance annually of one or more floods, or a 26% chance of one or more major floods occurring over a 30-year period (the average length of a mortgage). Within this flood zone, the majority

Figure 11 The beach along Delaware Bay in Slaughter Beach

of properties are located in VE or AE zones, which carry wave heights from 1.5 to over 3 feet on top of the "stillwater" inundation experienced during storm events. The exposure of the Town to flooding from coastal storms is significant due to its location along the Delaware Bay and its relatively low land elevation. Dunes provide an important, functional level of protection, particularly on the south end of Town. The dunes have experienced erosion from recent storms and this erosion is analogous to cracks in the armor protecting the south side of town from bayside storm surge and inundation.

When Spring Tide occur at the new and full moons, tides are higher than average. Sometimes the alignment takes place when the moon is closer to the earth in its elliptical, creating even more gravitational pull that results in King Tides. Higher than average tides such as King Tides and Spring Tides, or when can result in nuisance flooding in isolated spots of Town, including on Cedar Beach Road and along some residential properties. If the King or Spring Tide occurs at the same time as a storm event, the impact is magnified. Sea level rise also plays a role in further exacerbating impacts, and this will be discussed later in the report. The Town of Slaughter Beach is vulnerable to extreme tides because of its low elevation and placement next to tidally influenced waterways.

Figure 12 Flooding along Bay Ave. during October 2015 flood. Credit: Bill McSpadden

In order to interpret the ways that these flood hazards behave in Town during the present day (or near-past), the project team sought direct feedback from property owners and stakeholders. At the first public workshop on June 3, 2016, residents and stakeholders had the opportunity to mark points on aerial maps where they have witnessed or experienced flooding first hand. They recorded the leading edge of the flooding, whether the flooding came from the Bay or marsh, dates of flooding (if known), and impacts to the community such as impassable roads or property damage. Over 160 individual points, aligning with 20 different weather events, were recorded on the maps.

Each point was digitized onto a map and the corresponding information was added to an ArcGIS database for analysis. Points were categorized by date and the direction of the flooding, either from the marsh or Bay, as indicated by participants. The surface elevation at each point was calculated using State of Delaware LiDAR data. These elevations provided an estimate of the extent of the maximum recorded flood waters reached at each location.

Using the average elevation of all the points, a flood contour line was drawn to illustrate a composite representation of present day flood risk. The flood contour line was drawn at 1.25 meters (4.10 feet) of ground elevation to show the estimated extent of flooding from the marsh. Blue shading was used to represent the inundation in its path. See Appendix B for Flood

Contour Maps. Due to insufficient data points, a flood contour line representing flooding that originated from the Delaware Bay could not be created. The project team found that the Town of Slaughter Beach is experiencing more frequent flooding events and impacts from the marsh side of Town as compared to the Bay. However, it is worth noting that without the existing dune structure on the Bay side of Town, the Bay properties would experience more frequent impacts during major storm events. The dunes are an effective flood protection measure for the Town but they are experiencing a high degree of erosion. When storm surge penetrates the dune, as it did during Snowstorm Jonas in 2016, many homes experienced property damage and the dunes lost structure and depth. Unless this erosion is addressed, the dunes may not provide adequate flood protection in future storms.

Figure 13 Erosion along the Delaware Bayshore following a coastal storm. Credit: Bill McSpadden

3.2 Characterize Future Hazards

3.2.1 Precipitation

In order to thoroughly characterize flood risk, future conditions were also projected. First, the project team consulted climate projections prepared by the Delaware State Climatologist and other leading climatologists such as Dr. Katherine Hayhoe to assess changes to storm climatology. Delaware has a naturally high rate of variability when it comes to annual precipitation, but projections indicate that the intensity of rainfall is expected to increase over time (Delaware Climate Change Impact Assessment, p. 4-25). The increase is more dramatic later in the century, but over the next 20 years there will be a slight (up to 5 %) increase in annual precipitation with little to no change in the average number of dry days expected, meaning there will likely be more intense rainfall occurring during storms. This is corroborated by projections which show the number of days with rainfall over 2 inches increasing slightly by 2039 and more dramatically by the end of the Century. Heavier rainfall has the potential to overwhelm existing stormwater drains and infiltration systems, leading to localized flooding. For the Town of Slaughter Beach, heavy precipitation can lead to localized flooding of roadways and property for extended periods of time, but it is not assumed to increase the Town's vulnerability significantly within the next 20 years.

3.2.2 Sea Level Rise

Delaware has the lowest mean land elevation compared to other states, and it experiences a rate of sea level rise twice the global average due to geologic land subsidence and other factors. This

overall increase of sea surface height relative to land surface puts Delaware in a "hot spot" for sea level rise vulnerability (Recommendation of Sea-Level Rise Planning Scenarios for Delaware: Technical Report, 2017). Delaware will experience impacts including, but not limited to, beach erosion, inundation of low lying crops, conversion of wetlands into open water, and damage to private property and public infrastructure (septic systems, roads, water supply networks). Given these risks, the State of Delaware developed planning projections to help state agencies and communities prepare for sea level rise. These sea level rise projections use a scientifically vetted probabilistic approach based on different scenarios of global greenhouse gas emissions. The project team consulted these sea level rise projections, and selected the most conservative projection of one foot of sea level rise over the next 20 years. This scenario has a high (95%) degree of confidence that sea level rise will not exceed that threshold by 2037. Selecting the most conservative projection makes sense for the Town of Slaughter Beach due to its aging demographics and physical characteristics which make it especially vulnerable to sea level rise. The low-lying and flat elevation impedes the transport of water away from property and infrastructure. Its dune system has experienced erosion over the years and is not part of the federally and state-maintained dune system in Delaware.

Even the infiltration capacity of the vast marshland encircling the Town is thought to be highly sensitive to shoreline changes in other parts of the Bayshore. Past breaches at the Prime Hook Wildlife Refuge and the Misipillion River jetty led to more frequent flooding of Slaughter Beach roads and property until those breaches were repaired. It is likely that with one foot of sea level rise, the Town will experience more routine nuisance flooding of roads and property during high tides. Even more importantly, one foot of sea level rise will exacerbate flooding tied to coastal storms and heavy precipitation events.

To characterize the Town's vulnerability to flooding from a combination of sea level rise and coastal storms in the future, the project team added a second contour line to the average elevation of the flood points recorded by property owners during the first public workshop. The second line illustrates the potential flooding that may be experienced with one foot of sea level rise on top of flooding originating from the marsh during a major storm. In other words, the flood contour maps show a second line representing the leading edge of an additional foot of water (sea level rise) on top of storm inundation. Using the same approach mentioned previously, blue shading represents the land that has the potential to be inundated. See Appendix B. With the consistently low elevations found in Slaughter Beach, the composite flood contour maps indicate a very high degree of vulnerability to flooding from sea level rise and coastal storms.

[It is important to note that the contour maps are a visual representation of risk. They represent a worst case scenario and depict a uniform rate of inundation across the same elevation. The maps do not describe the depth of water or the behavior of water when it encounters manmade structures such as walls or berms. Further, the maps do not reflect erosion and condition of the dunes beyond what was mapped by LiDAR. Also, as previously stated, the team lacked sufficient data points from the public to draw a contour line for coastal storm flooding originating from the Bay. However, the team was able to draw a contour line representing 1 foot of sea level rise from the Bay. This line follows the Town's dune line in most places and indicates that the dunes

will serve as a sufficient barrier to 1 foot of sea level rise on sunny days. However, it is reasonable to expect significant erosion from the combined effects of sea level rise and storm surge during storm events and this may degrade or potentially breach the dunes. Some of this sand is transported and deposited north of the beach, with the southern part of Town more vulnerable to erosion. Without maintenance and upkeep, Slaughter Beach's dune system may not provide adequate protection for the Town over the next twenty years.]

3.2.3 Extreme heat

Besides coastal hazards that cause flooding, the vulnerability assessment also examined changes in extreme heat based upon the Town's higher age demographic and low percentage of tree cover. According to the Community Tree Canopy data on *FirstMap* (https://firstmap.delaware.gov/index.shtml), the Town has a 10.4% tree canopy over 234.7 acres which is lower than some other Bayshore towns (Bowers Beach has a 12.2% canopy and Lewes has a 34.2% canopy). The project team reviewed temperature trend data and projections for the 20 year study period based on the *Delaware Climate Change Impact Assessment*, 2014. As a baseline, Delaware has seen an increase in average temperatures at a rate of approximately 0.2°F per decade since 1895. A meaningful depiction of this hazard is the number of days per year that the local high temperature reached recognized thresholds such as 95 degrees. To demonstrate this, the project team looked at actual temperature observations from the Lewes, DE Cape Henlopen weather monitoring station for summer months in 2015 and 2016. Then, they compared it to state climate projections twenty years out, which show an increase over the baseline averages by the end of the study period. To display the information and compare results from present day to twenty years into the future, the project team used a calendar format to illustrate the heat waves that could be expected (Appendix C). The number of hot days (maximum temperature over 95° F) is projected to increase from the current average of less than 5 days per year to as many as 15 to 30 days by mid-century.

The extreme heat will place additional burden on air conditioning units and the power grid to keep up with the demand for electricity and cooling. Residents may need to curtail their outdoor activities during the heat waves due to poor air quality and excessive heat. Pets, the elderly, and other vulnerable populations may need special accommodations to withstand the heat.

Figure 14 Tidal wetlands in Slaughter Beach

3.3 Vulnerability Assessment Findings

The Town of Slaughter Beach's proximity to the Bay and marshes plus its low and flat elevation makes it highly vulnerable to flooding based on existing conditions. Bay side properties are occasionally battered on their east side by severe coastal storms and storm surge that erode the dunes, transport sand away from the south side of Town, and damage decks and residences. The flood contour mapping indicates that inundation of property, roads, and other infrastructure from the marshes is notably more prevalent. According to the analysis, Lighthouse Road and the area west of it along Cedar Beach Road (Route 36) is especially vulnerable and among the first locations to flood within Town. This is because of its low elevation (well below 1.25 meters), and proximity to the marsh and the mouth of Cedar Creek Canal. Other areas of high vulnerability include Slaughter Beach Road on either side of the Slaughter Creek Bridge which is low relative to the surrounding area. With the two access roads into Town being some of the first locations to flood, it is critical for the Town to have an awareness of water levels to insure safe passage.

Bay Avenue can act as a barrier for floodwaters coming from the marsh, making the lower lying properties on the west side of Bay Avenue more vulnerable compared to east side properties.

Properties on the east side of Bay Avenue have a very similar elevation to that of the adjacent marsh which inhibits draining, allowing water to sit for longer periods of time. This also increases the occurrence of flooding from heavy rainfall. Based on the project team's flood contour mapping, there appear to be isolated properties on the east side of Bay Avenue that experience more routine flooding due to the low lying property elevations and a lack of sufficient grade for drainage. (See map *645-573 Bay Avenue* in Appendix B)

The Town's vulnerability to flooding will be magnified by sea level rise and more intense rainfall over the next twenty years. According to the mapping analysis, which present a worst case scenario, the dunes will prevent inundation from one foot of sea level rise on the Bay side of Town during fair weather conditions, but storm surge from coastal storms is expected to be more severe. The combined effects of sea level rise and storm surge may increase erosion of the dunes, raising the risk of breaches and property damage from flooding. On the west side of Town, sea level rise by itself will decrease the capacity of the marsh to absorb excess stormwater and flood waters and it may lead to changes in flora and fauna. Septic systems and water supply lines will be at risk of a rising water table or saltwater intrusion. Periodic nuisance flooding is expected to increase in very low spots of town, including on Route 36. When sea level rise is combined with more intense precipitation events, coastal storms, or extreme tides, our mapping reveals a profound vulnerability to most parts of Town. Bay Avenue ceases to function as an adequate barrier to inundation from the marsh, putting Bayside homes in the path of floodwaters, particularly at the southernmost end of Bay Avenue, and north and north-central Bay Avenue. The properties located on the west side of Bay Avenue are either completely inundated or the majority of their property is exposed. Bayside properties at a high enough elevation are spared flooding but are not accessible during flood events since Route 36 and Slaughter Beach Road are impassable, posing a significant danger for evacuation.

Figure 15 High water in the marsh surrounding the Town of Slaughter Beach

In practical terms, this means many properties in Town will experience some level of flood damage during most storms unless strategies are put in place to mitigate impacts. Property owners can expect longer disruptions (on the order of days or even weeks) to their normal activities as they wait for roads to dry out and infrastructure repairs to be made. Some infrastructure will cease functioning reliably (such as septic systems) due to rising water tables and saltwater intrusion, and critical habitat for horseshoe crabs, migrating birds and other species will be altered.

The threat of extreme heat has some health implications for Slaughter Beach residents. The impacts would be greatest for vulnerable populations such as the economically disadvantaged, elderly, or those with underlying illnesses. High nighttime temperatures that often accompany heat waves are associated with many of these health impacts due to the body's inability to recuperate from the extreme daytime temperatures. Air quality degradation from ground-level ozone is also likely to increase with higher temperatures and heat waves. This will drive up the demand on energy for cooling needs while adding stress to electrical transmission and transportation infrastructure.

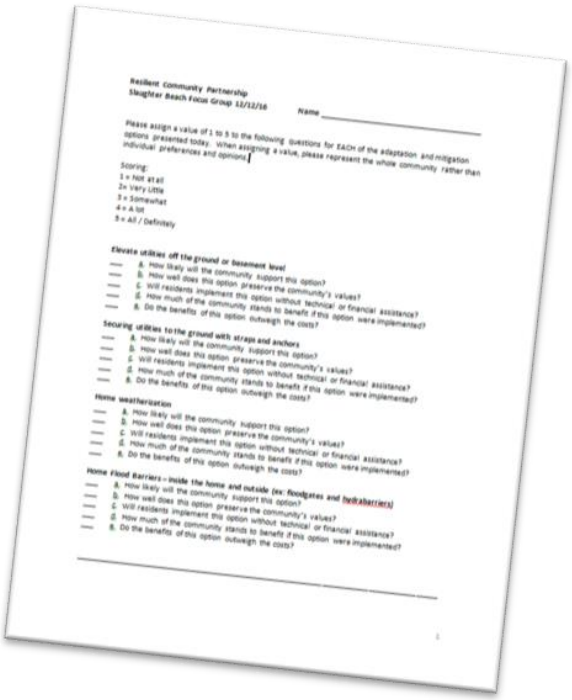
4 Develop Adaptation Measures

Figure 16 Public Workshop #2 October 8, 2016 Members of the Public Sticky Dot Voting on Potential Adaption Options

It is possible that sea level rise will increase by less than a foot over the next 20 years, that coastal storms and heavy precipitation events will not cause severe flooding, or that heat conditions will not worsen as expected, but if the Town's history of flooding, demographics, and geography are taken into account, there is a need to begin preparing now for future conditions and impacts. Towns like Slaughter Beach can improve their resiliency to these coastal hazards through planning, preparation, and implementation of adaptation and mitigation strategies. Typically, mitigation refers to efforts that reduce the severity of a risk. Stormwater mitigation projects like culverts, drains, and stormwater retention ponds are examples of strategies that reduce the risk of flooding by capturing, infiltrating, and transporting stormwater elsewhere. Adaptation refers to actions that help people adjust to or manage risks. Often, these actions are in the form of behavioral changes (planning errands around the tide cycle due to nuisance flooding on roads) or structural changes such as designing buildings to withstand higher force winds or building energy efficient homes in anticipation of higher temperatures.

The Town of Slaughter Beach has several constraints to improving its resiliency: a limited budget; town government staffed mainly by volunteers; lack of operational control over key infrastructure such as water supply networks and roads; a small, predominantly older population that is comprised of full time and seasonal property owners; a flat terrain that is bordered by wetlands and water, and competition for resources with other Delaware communities who are also at risk. These constraints make it more challenging to enact large-scale, costly investments in infrastructure upgrades that mitigate risk. However, the Town appropriately recognizes that it must partner with other agencies if it is going to be successful in implementing large mitigation projects. Presently, the Town is in early discussions with Sussex County and the City of Milford regarding the potential installation of sewer lines. The sewer system may connect to the County's system through Milford and would replace aging septic systems that could be vulnerable to flooding and saltwater intrusion. Active consideration is also being given to future stewardship of the Town's water supply, either through public or private purchase of the water supply company. These efforts are being undertaken separately from this project and are therefore not part of the final recommended strategies, but the project team supports these proactive discussions to improve infrastructure resiliency.

Town officials are also to be commended for communicating with DNREC and the U.S. Army Corps of Engineers concerning funding options for beach replenishment and dune maintenance. The demand for beach nourishment on Delaware's beaches far outpaces available funding. Creative financing options and the potential beneficial re-use of dredge materials from Delaware Bay are under active discussion. The Town's dunes play a critical role in helping the Town weather major storm events that bring flooding and storm surge. With sea level rise expected to exacerbate storm impacts in the future, it is paramount that the Town's dunes and beach be maintained. The project team encourages the Town to continue investigating options.


Resilient Community Partnership
Slaughter Beach Focus Group 11/12/16

Name_____

Please assign a value of 1 to 5 to the following questions for EACH of the adaptation and mitigation options presented today. When assigning a value, please represent the whole community rather than individual preferences and opinions.

Scoring:
1 = Not at all
2= Very Little
3 = Somewhat
4 = A lot
5 = All / Definitely

Elevate utilities off the ground or basement level
___ A. How likely will the community support this option?
___ B. How well does this option preserve the community's values?
___ C. Will residents implement this option without technical or financial assistance?
___ D. How much of the community stands to benefit if this option were implemented?
___ E. Do the benefits of this option outweigh the costs?

Securing utilities to the ground with straps and anchors
___ A. How likely will the community support this option?
___ B. How well does this option preserve the community's values?
___ C. Will residents implement this option without technical or financial assistance?
___ D. How much of the community stands to benefit if this option were implemented?
___ E. Do the benefits of this option outweigh the costs?

Home weatherization
___ A. How likely will the community support this option?
___ B. How well does this option preserve the community's values?
___ C. Will residents implement this option without technical or financial assistance?
___ D. How much of the community stands to benefit if this option were implemented?
___ E. Do the benefits of this option outweigh the costs?

Home Flood Barriers – inside the home and outside (ex: floodgates and hydrabarriers)
___ A. How likely will the community support this option?
___ B. How well does this option preserve the community's values?
___ C. Will residents implement this option without technical or financial assistance?
___ D. How much of the community stands to benefit if this option were implemented?
___ E. Do the benefits of this option outweigh the costs?

Figure 17 Town of Slaughter Beach Focus Group Adaptation Strategy Criteria Guidance

While these large-scale investments in mitigation are explored, the Town of Slaughter Beach has many adaptation strategies available to it to help it cope with risks from flooding, sea level rise, and extreme heat. If implemented, these options will help maintain quality of life, safety, and honor the Town's vision for itself over the next 20 years. Some of these adaptation strategies rest with the Town to implement in coordination with partners, whereas other strategies are specific to individual property owners. It cannot be overstated that resiliency planning begins with the individual, particularly in a town where the majority of the land and built structures are privately-owned. The project team supports the stormwater infrastructure and road improvements recommended in the Bay Beach Coastal Drainage Evaluation report, prepared by URS Corporation in 2014 for the State. The report identifies a number of improvements, many at the homeowner level, that if undertaken, would mitigate some of the flooding and improve the overall resiliency of the homes and neighboring lots. Town officials and property owners are encouraged to revisit the study and prioritize investments in some of these recommendations.

The following table identifies the set of mitigation and adaptation strategies recommended for the Town of Slaughter Beach as part of this Resilient Community Partnership project. These options were developed in coordination with Town officials and property owners. Initial brainstorming began during the second public workshop in October 2016 when attendees were invited to mark their preferences for initial mitigation and adaptation options through "sticky dot" voting. See Appendix D. This input, which covered a portion of the strategies ultimately recommended, helped inform identification and investigation of options. Over the course of the fall, the project team refined the list based on the voting and their research into each option's feasibility and effectiveness for managing risk. In December, 2016, the project team led two focus group sessions with property owners representing a cross section of Town.

The focus groups listened to a briefing on each strategy and then scored each strategy according to the below criteria. The criteria were aimed at determining which strategies could achieve the buy-in necessary for implementation at the local level:

1. How likely will the community support this option?
2. How well does this option preserve the community's values?
3. Will residents implement this option without technical or financial assistance?
4. How much of the community stands to benefit if this option were implemented?
5. Do the benefits of this option outweigh the costs?

Scoring:

1 = Not at all

2= Very Little

3 = Somewhat

4 = A lot

5 = All / Definitely

4.1 Slaughter Beach Focus Group Results of Adaptation Strategies:

	Avg-Grp1	Avg-Grp2	Avg-Both Groups	Overall Avg
Elevate Utilities				3.7
a - community support	4.0	3.9	3.9	
b - preserve community values	3.7	3.6	3.6	
c - implementable	2.7	2.9	2.8	
d - community benefit	3.9	3.7	3.8	
e - do benefits outweigh costs	4.6	4.1	4.4	
Secure Utilities to Ground				3.8
a - community support	3.6	4.0	3.8	
b - preserve community values	3.6	3.9	3.7	
c - implementable	2.9	2.9	2.9	
d - community benefit	4.1	4.3	4.2	
e - do benefits outweigh costs	4.4	4.1	4.3	
Home Weatherization				3.3
a - community support	3.3	3.1	3.2	
b - preserve community values	3.6	3.1	3.4	
c - implementable	3.0	2.1	2.6	
d - community benefit	3.3	3.3	3.3	
e - do benefits outweigh costs	4.3	3.6	3.9	
Home Flood Barriers				3.4
a - community support	3.3	3.0	3.1	
b - preserve community values	3.3	3.4	3.4	
c - implementable	3.0	2.4	2.7	
d - community benefit	3.6	3.6	3.6	
e - do benefits outweigh costs	4.6	3.7	4.1	
Landscaping				2.8
a - community support	2.9	2.6	2.7	
b - preserve community values	3.1	3.0	3.1	
c - implementable	2.3	2.3	2.3	
d - community benefit	3.1	2.9	3.0	

e - do benefits outweigh costs	2.9	2.9	2.9	
Green Infrastructure				3.2
a - community support	3.4	2.9	3.1	
b - preserve community values	4.1	3.1	3.6	
c - implementable	3.3	2.0	2.6	
d - community benefit	3.7	3.0	3.4	
e - do benefits outweigh costs	3.9	3.0	3.4	
Household Emergency Plans				4.1
a - community support	4.0	4.0	4.0	
b - preserve community values	3.9	3.7	3.8	
c - implementable	3.9	3.4	3.6	
d - community benefit	4.9	4.3	4.6	
e - do benefits outweigh costs	4.9	4.3	4.6	
Community Wide Emergency Plan				4.4
a - community support	4.0	4.6	4.3	
b - preserve community values	4.6	4.4	4.5	
c - implementable	4.0	3.9	3.9	
d - community benefit	4.7	4.7	4.7	
e - do benefits outweigh costs	5.0	4.6	4.8	
Education & Outreach				4.4
a - community support	3.9	4.1	4.0	
b - preserve community values	4.1	4.4	4.3	
c - implementable	3.9	4.0	3.9	
d - community benefit	4.9	4.7	4.8	
e - do benefits outweigh costs	4.9	4.7	4.8	
Small Scale Beach Nourishment				3.8
a - community support	3.1	4.0	3.6	
b - preserve community values	4.7	4.4	4.6	
c - implementable	1.9	3.3	2.6	
d - community benefit	3.9	4.3	4.1	
e - do benefits outweigh costs	3.4	4.7	4.1	
Large Scale Beach Nourishment				3.5
a - community support	3.6	4.3	3.9	

b - preserve community values	4.4	4.4	4.4	
c - implementable	1.3	1.9	1.6	
d - community benefit	3.9	4.6	4.2	
e - do benefits outweigh costs	3.1	4.0	3.6	
Dune Stewardship				4.5
a - community support	4.1	4.3	4.2	
b - preserve community values	4.9	4.3	4.6	
c - implementable	3.9	3.7	3.8	
d - community benefit	5.0	4.9	4.9	
e - do benefits outweigh costs	5.0	4.8	4.8	
High Tech Real Time System				3.9
a - community support	3.9	4.3	4.1	
b - preserve community values	3.3	4.0	3.6	
c - implementable	2.7	3.6	3.1	
d - community benefit	4.1	4.1	4.1	
e - do benefits outweigh costs	4.4	4.1	4.3	
Low Tech Real Time System				4.5
a - community support	4.6	4.6	4.6	
b - preserve community values	3.9	4.3	4.1	
c - implementable	4.3	4.0	4.1	
d - community benefit	4.7	4.6	4.6	
e - do benefits outweigh costs	5.0	4.7	4.9	
Elevating Roads				3.4
a - community support	4.1	3.4	3.8	
b - preserve community values	4.1	3.4	3.8	
c - implementable	2.0	1.6	1.8	
d - community benefit	4.6	3.9	4.2	
e - do benefits outweigh costs	3.9	3.1	3.5	
Retreat				2.3
a - community support	2.1	2.0	2.1	
b - preserve community values	2.7	1.7	2.2	
c - implementable	2.4	1.6	2.0	
d - community benefit	3.1	2.3	2.7	
e - do benefits outweigh costs	2.7	2.0	2.4	

When the results of the focus groups were tabulated, it became clear that the strategies that earned the highest scores were those strategies that could be implemented at the homeowner and community level without a great deal of funding or assistance. Those strategies that required greater investments and coordination (i.e. large-scale beach nourishment) still rated as important to the community but scored lower overall. This finding underscores the inherent realities of resiliency planning for coastal towns in Delaware. There is a shortage of resources for resiliency improvements. The adaptation and mitigation strategies that are easier to implement are often the options that do not depend on outside funding for the majority of the project's costs.

Next, the focus group results were shared with Town Council officials who reviewed the adaptation and mitigation strategies with the project team and agreed on the final recommendations based on their feasibility, capacity to be implemented, and overall benefit to resiliency. The following table identifies the adaptation and mitigation options recommended under the Resilient Community Partnership in two broad categories: High Priority and Priority. They are not listed in any particular order or weight.

4.2 Town of Slaughter Beach Resilient Community Partnership Recommended Adaptation and Mitigation Strategies:

Strategy	*Lead*	*Partners*	*Implementation Status*
Real-Time Transportation Warning System - Integrate Rt. 36 and Slaughter Beach Road into the state's real-time transportation monitoring system so that residents and visitors are alerted of flood conditions on roadways via the DelDOT app (Phase I); install interactive signage and promote outreach on the real-time system (Phase II)	DelDOT	DNREC, Town, UD, USGS	Installation of Phase I completed October 2017; Phase II underway
Community Preparedness Education & Outreach - Promote outreach and education on emergency preparedness and resiliency to hazards such as flooding and extreme heat; Schedule an annual Community Preparedness Day and invite guest speakers from state, county, and local agencies	Town	DNREC	First annual workshop held July 22, 2017. Preparedness information table available at the Green Head 5K Race on May 6, 2018.
Secure Utility Tanks to the Ground - Promote public safety by working with homeowners and utility companies to secure propane tanks and other utility tanks to the ground	Town	Utility companies	Letter to residents mailed June 2017; outreach to utilities underway
Beach Nourishment - Invest in small-scale beach nourishment projects to address critically eroded locations; Continue dialogue with federal and state partners regarding large-scale beach nourishment and the beneficial reuse of dredge spoils; explore alternate revenue sources of Town match for beach nourishment projects	Town	DNREC, USACE	
Community Wide Emergency Plan - Update and finalize community emergency operations plan. Coordinate with County, DEMA, and Fire Company; Form community workgroup to update and refine emergency planning content on website	Town	County, DEMA, Fire Company	Draft completed and under review
Elevate Homes and Utilities - Raise a/c units, generators, and the lower level of existing and new houses and structures above FEMA's base flood elevation (BFE) by an additional 18 inches or more	Homeowner	DEMA	

Strategy	*Lead*	*Partners*	*Implementation Status*
Dune Stewardship - Protect existing dunes through signage and outreach that discourages foot traffic and the improper stowing of boats, kayaks, and beach equipment on dunes; Actively encourage maintenance and planting of native grasses	Town	DNREC	
Household Emergency Plans - Develop emergency protocols for a wide range of emergencies, including floods, heat waves, and lengthy power outages; assist elderly or disabled neighbors with drafting of a safety plan; consider protocols for pets; secure property in the event of an emergency	Homeowner	Town, Fire Company	
Home Floodproofing - Encourage dry floodproofing through the use of barriers such as aqua bags, flood gates, or flood panels to seal off doors and garages in the event of minor to moderate flooding; explore efficacy of using barriers such as berms or flood walls that do not aggravate flooding on nearby properties	Homeowner	Town, DEMA	
Landscaping/Stormwater Improvements - Continue working with DelDOT to locate storm water drains; conduct routine maintenance and clearing of debris from drains; implement recommendations of Bay Beach Coastal Drainage Engineering Report	Town, homeowner	DelDOT, DEMA	
Elevate Roads - Explore with DelDOT the cost and feasibility of raising segments of Town roads that are most at risk of flooding; consider partial mitigation measures as necessary	DelDOT	Town	
Home Weatherization - Conduct energy audits; modernize cooling and heating systems to improve energy efficiency; adopt more protective construction standards	Homeowner	SEU, DNREC	
Green Infrastructure - Improve stormwater infiltration and management through the use of natural systems such as bioswales & rain gardens	Town, Homeowner	DNREC	
Retreat, Re-Locate or Avoid - Avoid new construction or substantial remodeling on parcels that are prone to repetitive flooding; consider relocating structures away from the flood zone on a case by case basis; convert flood-prone parcels to open space	Town, homeowner	DEMA	

5 Take Implementation Action

Figure 18 Example of DelDOT Flood Warning Signage

This project benefited from a highly motivated Town Council, Mayor, and community. The Town's stewardship culture and community spirit no doubt fostered interest in preserving the Town's way of life. This created an excellent foundation to build upon. Together with Town leaders, the project team emphasized outreach and education to the community about flooding and extreme heat risks. The team also capitalized on partnerships that were cultivated during the project: in particular, the involvement of Delaware Department of Transportation and the University of Delaware in the public workshops, identification of adaptation strategies, and the installation of water monitoring sensors in the Town's marshes.

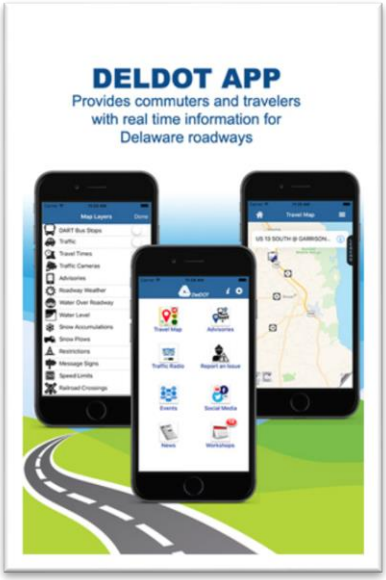


Figure 19 DelDOT Mobile App for Download

This latter idea involved a pilot project run by the University of Delaware to install water sensors in the marshes that would monitor water levels over time. Despite many advances in monitoring of hydrological conditions in the Delaware Bay, there is much work to be done to understand the hydrology of marshes in Delaware. In particular, more research is needed to understand their water storage capacity and how it changes with the tides and weather. The project team volunteered the Town of Slaughter Beach to serve as an important pilot community to help University of Delaware (UD) researchers monitor water flows inside the marsh. While the observations would not be collected in time to support this project's analysis, the data will shed light on the marsh's hydrology in the long term and support efforts to understand under what conditions flooding occurs from the marsh. The community enthusiastically supported this pilot and continues to communicate with the UD about the data.

Following installation of the water sensors, an idea quickly emerged that combines the water monitoring pilot with DelDOT's intelligent transportation system technology to create an adaptation tool for the Town. Over the years, DelDOT began installing water sensors, cameras, and interactive signs on roadways to monitor road conditions in real-time. If a road becomes flooded or blocked by traffic or an accident, the system alerts DelDOT's traffic management center so it can divert traffic, adjust the timing of stop lights, and so forth. This technology helps DelDOT manage the system efficiently and adapt to incidents in quick order. The project team saw the potential for this technology to also serve the adaptation needs of individual towns. In this case, to support a town like Slaughter Beach whose two primary access roads (and evacuation routes) are low in elevation, highly vulnerable to flooding and are several miles long. The sheer length of the roads makes wholesale elevating of the roads too expensive an option to

undertake. In the past, residents and visitors traveling between Route 1 and the Town would incur time-consuming delays after being forced to back track several miles when they encountered flooding. There was no warning and some people chose to risk their safety by crossing the flooded sections. These incidents are likely to increase with more frequency in the future, disrupting daily schedules and risking public safety. But by leveraging the water sensors and expertise of UD scientists, together with DelDOT's real-time transportation management technology, the project team found an adaptation tool that will help Slaughter Beach adapt to more frequent road flooding. DelDOT and UD agreed to partner with the team and the Town to turn this idea into a reality. In October 2017, a tide gauge was installed on one of the roads along with a modem and logger to enable real-time communication. The existing water sensors were networked into the system and it was added as an operational component of DelDOT's statewide real-time transportation monitoring system, visible on the DelDOT app. Phase II planning is underway. Phase II will involve the installation of two interactive signs on Route 36 and Slaughter Beach Road that will flash to warn motorists exiting Route 1 of flooding down those roads. This will allow motorists the chance to adjust their route before embarking miles and miles down one road only to encounter flooding and have to back track. This adaptation measure will not only save time and assist with route planning, but it will promote public safety and help the community maintain quality of life even as roadway flooding events increases. In addition, it demonstrates the benefits of partnering and leveraging resources that promote win-win benefits for all parties involved.

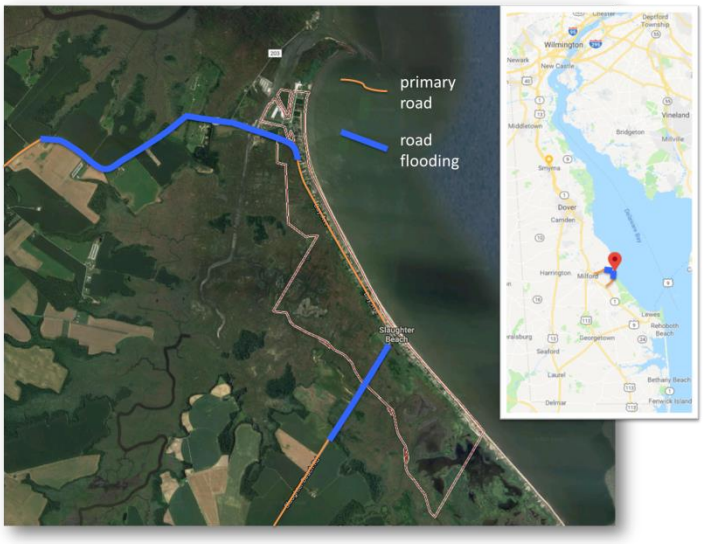


Figure 20 Approximate area of potential road flooding on primary access roads to the Town of Slaughter Beach

To further capitalize on the momentum and energy inspired by this project, the team designed its last public workshop to double as a Community Preparedness Day. This addresses one of the strategies recommended by the project team – to hold an annual preparedness event to keep planning and resiliency on the minds of residents and visitors to Slaughter Beach. The public workshop briefed residents on the outcomes of the project, but also included presentations by DelDOT on the new real-time system and the local Fire Chief and Delaware Emergency Management Agency on emergency preparedness topics. The workshop was well attended and serves as a model the community could adopt for future annual preparedness events.

Concurrently with these efforts, the Town sent a formal letter in June 2017 to property owners about the need to secure propane tanks or other outdoor tanks. Left unsecured, these tanks can become mobile projectiles during major storm surge and flooding, causing property damage or worse, fires. Thus, the project team included the securing of tanks as an important adaptation strategy. The Town has also contacted local utility companies to encourage their cooperation in securing the tanks.

Figure 21 Example of a secured oil tank

Also in the process of implementation, the Town prepared a new draft of its emergency operations plan based in part on the findings of this assessment. The plan is under review with the County and once finalized it will address another of the recommendations. Outreach on the plan and its components will be important to its utility and effectiveness in the long run.

6 Conclusion

Through this project and the initiative of Town officials, Slaughter Beach has grown its capacity to undertake important steps toward improving resiliency. As the above implementation actions illustrate, the Town is committed to working with partners and capitalizing on opportunities to promote adaptation and risk mitigation. The mayor and Council members are investing their time and energy in implementation, and the community has signaled their interest and receptiveness to resiliency planning by turning out in great numbers for the public workshops, by volunteering, and expressing support for the implementation strategies. Further, the Town now has more information and analysis about flood risks than before. It has maps to help communicate and characterize risks. It has trusted partnerships and experts who can counsel the Town and offer technical assistance.

Because of the changing nature of our climate and our land uses, it is recommended that the Town undergo another comprehensive assessment of coastal hazards every five to ten years to update its planning and preparations. It is conceivable that beyond 20 years, the Town will face harder choices including retreating from some high risk parcels. But with proactive planning and implementation now, the Town can make important strides in preserving its vision for the future.

Figure 22 Discussions at the Public Workshop #3 July 2017

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Appendix A: Town of Slaughter Beach Household Inventory Elevations

House Number	Street Name	Inventory Type	Ground Elevation Below Inventory (ft)	Finished Floor Elevation	100 Yr Flood Elevation (ft)	FEMA Flood Zone
201	BAY AV	septic	6.80	10.03	10	AE
201	BAY AV	ac	5.05	10.03	10	AE
203	BAY AV	septic	5.19	12.13	9	AE
203	BAY AV	propane	6.25	12.13	9	AE
213	BAY AV	ac	7.57	13.76	8	AE
213	BAY AV	septic	5.64	13.76	8	AE
215	BAY AV	ac	7.42	10.52	8	AE
217	BAY AV	propane	6.19	6.32	8	AE
217	BAY AV	gas/oil	6.42	6.32	8	AE
217	BAY AV	ac	8.58	6.32	8	AE
217	BAY AV	septic	5.18	6.32	8	AE
219	BAY AV	propane	8.13	6.66	10	VE
223	BAY AV	ac	8.13	6.62	10	VE
225	BAY AV	ac	5.88	5.89	8	AE
225	BAY AV	ac	6.16	5.89	8	AE
225	BAY AV	propane	5.19	5.89	8	AE
227	BAY AV	septic	5.58	13.23	10	VE
229	BAY AV	ac	8.57	11.93	10	VE
231	BAY AV	ac	8.25	6.61	10	VE
231	BAY AV	ac	9.22	6.61	10	VE
235	BAY AV	ac	8.11	8.10	10	VE
235	BAY AV	ac	6.41	8.10	10	VE
237	BAY AV	ac	6.70	7.01	10	VE
241	BAY AV	propane	6.79	12.41	10	VE
241	BAY AV	propane	6.62	12.41	10	VE
241	BAY AV	ac	7.87	12.41	10	VE
247	BAY AV	ac	7.06	6.00	8	AE
247	BAY AV	ac	7.02	6.00	8	AE
249	BAY AV	ac	6.67	9.77	10	VE
251	BAY AV	ac	8.35	11.87	10	VE
255	BAY AV	generator	8.39	8.11	10	VE
255	BAY AV	propane	10.61	8.11	10	VE
257	BAY AV	generator	9.32	10.32	10	VE
257	BAY AV	ac	8.43	10.32	10	VE

House Number	Street Name	Inventory Type	Ground Elevation Below Inventory (ft)	Finished Floor Elevation	100 Yr Flood Elevation (ft)	FEMA Flood Zone
261	BAY AV	propane	10.28	12.20	10	VE
261	BAY AV	ac	9.01	12.20	10	VE
261	BAY AV	gas/oil	6.05	12.20	10	VE
263	BAY AV	gas	6.91	5.91	10	VE
265	BAY AV	septic	7.21	12.60	10	VE
265	BAY AV	ac	8.15	12.60	10	VE
267	BAY AV	septic	7.87	16.36	10	VE
267	BAY AV	ac	6.90	16.36	10	VE
271	BAY AV	gas	9.22	14.14	10	VE
271	BAY AV	septic	10.21	14.14	10	VE
279	BAY AV	ac	9.64	11.54	10	VE
279	BAY AV	propane	7.85	11.54	10	VE
279	BAY AV	ac	6.23	11.54	10	VE
281	BAY AV	propane	7.94	8.14	10	VE
281	BAY AV	septic	8.92	8.14	10	VE
285	BAY AV	septic	9.60			
285	BAY AV	ac	6.12			
287	BAY AV	gas/oil	7.34	10.86	10	VE
287	BAY AV	ac	8.84	10.86	10	VE
291	BAY AV	ac	6.75	10.62	10	VE
291	BAY AV	ac	8.74	10.62	10	VE
293	BAY AV	ac	8.68	10.74	10	VE
295	BAY AV	septic	7.74	10.74	10	VE
297	BAY AV	ac	5.97	7.61	8	AE
301	BAY AV	propane	8.24	8.16	10	VE
301	BAY AV	septic	6.11	8.16	10	VE
307	BAY AV	ac	7.70	10.90	10	VE
307	BAY AV	generator	8.23	10.90	10	VE
305	BAY AV	septic	7.90	11.36	10	VE
309	BAY AV	propane	5.81	6.21	10	VE
309	BAY AV	ac	6.11	6.21	10	VE
311	BAY AV	propane	6.96	7.30	10	VE
311	BAY AV	ac	6.84	7.30	10	VE
313	BAY AV	propane	8.46	10.33	10	VE
313	BAY AV	ac	7.85	10.33	10	VE
315	BAY AV	ac	8.30	8.85	10	VE
317	BAY AV	gas/oil	7.82	9.27	10	VE
317	BAY AV	septic	8.92	9.27	10	VE

House Number	Street Name	Inventory Type	Ground Elevation Below Inventory (ft)	Finished Floor Elevation	100 Yr Flood Elevation (ft)	FEMA Flood Zone
319	BAY AV	propane	7.98	10.32	10	VE
321	BAY AV	ac	7.52	16.14	10	VE
321	BAY AV	propane	7.54	16.14	10	VE
327	BAY AV	ac	8.46	8.76	10	VE
329	BAY AV	ac	8.07	14.99	10	VE
331	BAY AV	propane	8.37	9.68	10	VE
333	BAY AV	propane	7.74	7.08	8	AE
335	BAY AV	ac	8.94	18.96	10	VE
335	BAY AV	septic	9.38	18.96	10	VE
337	BAY AV	ac	9.02	11.12	10	VE
337	BAY AV	septic	8.05	11.12	10	VE
339	BAY AV	propane	8.01	8.92	10	VE
343	BAY AV	septic	8.68	15.90	10	VE
343	BAY AV	ac	7.58	15.90	10	VE
343	BAY AV	propane	7.23	15.90	10	VE
349	BAY AV	propane	7.47	8.32	10	VE
349	BAY AV	ac	7.76	8.32	10	VE
349	BAY AV	propane	7.66	8.32	10	VE
350	BAY AV	ac	4.55	5.14	8	AE
350	BAY AV	septic	4.26	5.14	8	AE
350	BAY AV	propane	4.21	5.14	8	AE
351	BAY AV	septic	7.67			
355	BAY AV	propane	8.32	15.33	10	VE
357	BAY AV	fire top of parking lot	7.99	7.01	10	VE
357	BAY AV	fire bottom parking lot	5.80	7.01	10	VE
357	BAY AV	bath house	10.63	7.01	10	VE
357	BAY AV	pavilion	10.96	7.01	10	VE
358	BAY AV	gas/oil	3.60			
358	BAY AV	tennis courts	5.12	5.47	8	AE
358	BAY AV	basket ball courts	4.56	5.47	8	AE
358	BAY AV	well	3.54	5.47	8	AE
358	BAY AV	pump house	4.27	5.47	8	AE

House Number	Street Name	Inventory Type	Ground Elevation Below Inventory (ft)	Finished Floor Elevation	100 Yr Flood Elevation (ft)	FEMA Flood Zone
359	BAY AV	septic	10.74	5.47	8	AE
359	BAY AV	propane	10.39	5.47	8	AE
359	BAY AV	ac	9.82	5.47	8	AE
359	BAY AV	fire bay entrance	5.88	5.47	8	AE
361	BAY AV	ac	7.31	8.38	10	VE
362	BAY AV	ac	4.40	6.35	8	AE
362	BAY AV	ac	4.70	6.35	8	AE
362	BAY AV	ac	4.65	6.35	8	AE
362	BAY AV	septic	3.92	6.35	8	AE
363	BAY AV	ac	8.04	9.09	10	VE
369	BAY AV	ac	7.77	8.47	10	VE
369	BAY AV	propane	7.24	8.47	10	VE
370	BAY AV	septic	5.54			
370	BAY AV	septic	6.43			
371	BAY AV	ac	6.70	8.79	10	VE
373	BAY AV	ac	7.40	11.52	10	VE
373	BAY AV	septic	6.98	11.52	10	VE
375	BAY AV	propane	7.10	8.27-8.62	10	VE
377	BAY AV	ac	7.37			
377	BAY AV	ac	7.20			
379	BAY AV	propane	7.37	14.19	10	VE
381	BAY AV	gas/oil	7.65	7.86-8.95	10	VE
381	BAY AV	propane	7.25	7.86-8.95	10	VE
383	BAY AV	gas/oil	7.07			
383	BAY AV	propane	7.05			
383	BAY AV	ac	6.82			
383	BAY AV	ac	7.44			
385	BAY AV	septic	7.43	8.47	10	VE
386	BAY AV	propane	4.52			
387	BAY AV	ac	8.06			
389	BAY AV	ac	6.87	9.16	10	VE
391	BAY AV	ac	8.00	9.06	10	VE
391	BAY AV	propane	7.46	9.06	10	VE
393	BAY AV	gas/oil	7.19	8.52-8.63	10	VE
395	BAY AV	ac	7.29			
395	BAY AV	propane	7.27			
399	BAY AV	septic	7.44	9.25	10	VE

House Number	Street Name	Inventory Type	Ground Elevation Below Inventory (ft)	Finished Floor Elevation	100 Yr Flood Elevation (ft)	FEMA Flood Zone
399	BAY AV	propane	7.52	9.25	10	VE
403	BAY AV	ac	8.26	9.23	10	VE
405	BAY AV	ac	6.95	9.65	10	VE
407	BAY AV	propane	6.58	9.62	10	VE
407	BAY AV	septic	7.00	9.62	10	VE
407	BAY AV	propane	3.03	9.62	10	VE
407	BAY AV	ac	3.12	9.62	10	VE
409	BAY AV	septic	8.82	9.18	10	VE
413	BAY AV	ac	7.63	10.57	10	VE
413	BAY AV	septic	6.80	10.57	10	VE
415	BAY AV	propane	8.02	12.80	10	VE
415	BAY AV	ac	8.12	12.80	10	VE
415	BAY AV	septic	7.46	9.16-12.80	10	VE
416	BAY AV	septic	8.21	5.60	9	AE
416	BAY AV	propane	3.64	5.60	9	AE
417	BAY AV	propane	7.40			
417	BAY AV	ac	7.44			
417	BAY AV	septic	6.96			
418	BAY AV	ac	4.83	6.36	9	AE
418	BAY AV	propane	4.91	6.36	9	AE
421	BAY AV	propane	8.55			
423	BAY AV	ac	8.11	8.74	10	VE
423	BAY AV	propane	7.65	8.74	10	VE
425	BAY AV	propane	7.86	9.00	10	VE
427	BAY AV	ac	8.56	11.26	10	VE
427	BAY AV	septic	7.55	11.26	10	VE
429	BAY AV	ac	6.60	9.32	10	VE
429	BAY AV	propane	7.75	9.32	10	VE
433	BAY AV	propane	7.76	10.27	10	VE
433	BAY AV	ac	8.09	10.27	10	VE
438	BAY AV	septic	5.05	6.35	9	AE
439	BAY AV	ac	7.60	10.90	10	VE
440	BAY AV	propane	4.27	6.74	9	AE
440	BAY AV	septic	6.96	6.74	9	AE
441	BAY AV	ac	9.24	8.31	10	VE
442	BAY AV	septic	6.14	17.41	9	AE
442	BAY AV	ac	3.65	17.41	9	AE
443	BAY AV	septic	7.19	7.60-10.90	10	VE

House Number	Street Name	Inventory Type	Ground Elevation Below Inventory (ft)	Finished Floor Elevation	100 Yr Flood Elevation (ft)	FEMA Flood Zone
445	BAY AV	gas/oil	6.48	7.91	8	AE
445	BAY AV	ac	6.49	7.91	8	AE
448	BAY AV	ac	4.65	5.88	9	AE
449	BAY AV	ac	8.82	11.53	10	VE
449	BAY AV	propane	9.14	11.53	10	VE
450	BAY AV	ac	4.00	4.20	9	AE
452	BAY AV	propane	3.92			
452	BAY AV	septic	3.01			
453	BAY AV	ac	5.92	7.76	8	AE
455	BAY AV	septic	5.39	10.28	10	VE
455	BAY AV	septic	6.46	10.28	10	VE
456	BAY AV	ac	4.57	4.94	9	AE
458	BAY AV	gas/oil	3.71	4.49	9	AE
458	BAY AV	propane	3.92	4.49	9	AE
459	BAY AV	septic	7.85	10.52	10	VE
460	BAY AV	ac	3.67	5.28	9	AE
461	BAY AV	propane	7.77	8.91	10	VE
462	BAY AV	gas/oil	4.39	6.18	9	AE
463	BAY AV	septic	6.00	9.18	10	VE
464	BAY AV	gas/oil	4.47	6.38	9	AE
465	BAY AV	gas/oil	8.29	7.70	10	VE
465	BAY AV	septic	7.99	7.70	10	VE
467	BAY AV	septic	6.91	8.30	10	VE
469	BAY AV	gas/oil	8.05	8.31	10	VE
466	BAY AV	propane	3.68	5.05	9	AE
471	BAY AV	ac	7.03	7.56	10	VE
472	BAY AV	propane	3.87	4.82	9	AE
473	BAY AV	ac	7.09	7.90	10	VE
473	BAY AV	septic	6.98	7.90	10	VE
473	BAY AV	ac	7.06	7.90	10	VE
474	BAY AV	ac	4.06	5.77	9	AE
475	BAY AV	propane	7.36	8.83-9.28	10	VE
475	BAY AV	septic	7.36	8.83-9.29	10	VE
477	BAY AV	propane	6.15			
477	BAY AV	septic	7.45			
476	BAY AV	ac	4.11	4.95	9	AE
481	BAY AV	septic	5.74	15.53	10	VE
481	BAY AV	ac	6.48	15.53	10	VE

House Number	Street Name	Inventory Type	Ground Elevation Below Inventory (ft)	Finished Floor Elevation	100 Yr Flood Elevation (ft)	FEMA Flood Zone
483	BAY AV	propane	6.07	13.96	10	VE
483	BAY AV	ac	7.05	13.96	10	VE
485	BAY AV	septic	5.34	13.82	10	VE
485	BAY AV	ac	5.27	13.82	10	VE
487	BAY AV	ac	4.83	12.30	10	VE
487	BAY AV	propane	4.63	12.30	10	VE
489	BAY AV	septic	4.04			
494	BAY AV	propane	3.52	4.38	9	AE
494	BAY AV	ac	3.54	4.38	9	AE
495	BAY AV	septic	7.80	5.48	10	VE
495	BAY AV	ac	4.34	5.48	10	VE
499	BAY AV	ac	4.73			
503	BAY AV	propane	4.75	4.52-13.87	10	VE
505	BAY AV	ac	3.94	5.00	8	AE
505	BAY AV	ac	4.68	5.00	8	AE
507	BAY AV	ac	4.09	4.50	8	AE
507	BAY AV	septic	6.46	4.50	8	AE
509	BAY AV	propane	4.28			
511	BAY AV	propane	4.19	5.27	10	VE
511	BAY AV	ac	4.16	5.27	10	VE
511	BAY AV	septic	5.01	5.27	10	VE
515	BAY AV	ac	4.13	4.70	10	VE
515	BAY AV	septic	4.35	4.70	10	VE
517	BAY AV	septic	4.98	6.70	10	VE
517	BAY AV	propane	3.97	6.70	10	VE
517	BAY AV	ac	4.39	6.70	10	VE
518	BAY AV	ac	3.05	3.67	9	AE
521	BAY AV	ac	3.87	4.99	10	VE
521	BAY AV	propane	4.03	4.99	10	VE
522	BAY AV	ac	3.29	3.51	9	AE
522	BAY AV	propane	3.04	3.51	9	AE
525	BAY AV	ac	5.14	5.71	10	VE
526	BAY AV	ac	3.56	4.15	9	AE
527	BAY AV	ac	2.77	10.54	8	AE
529	BAY AV	septic	3.23	10.40	10	VE
545	BAY AV	propane	8.18	7.65	10	VE
547	BAY AV	ac	4.42	7.69	8	AE
547	BAY AV	propane	4.16	7.69	8	AE

House Number	Street Name	Inventory Type	Ground Elevation Below Inventory (ft)	Finished Floor Elevation	100 Yr Flood Elevation (ft)	FEMA Flood Zone
551	BAY AV	propane	4.44	14.62	8	AE
551	BAY AV	ac	4.52	14.62	8	AE
553	BAY AV	ac	6.22	14.70	8	AE
557	BAY AV	propane	7.20	9.37	10	VE
559	BAY AV	propane	7.40	12.16	10	VE
563	BAY AV	ac	5.85	7.16	8	AE
565	BAY AV	propane	5.93	11.13	8	AE
565	BAY AV	propane	5.70	11.13	8	AE
571	BAY AV	ac	6.70	14.17	8	AE
571	BAY AV	ac	4.13	14.17	8	AE
573	BAY AV	propane	4.50	12.40	8	AE
573	BAY AV	ac	4.46	12.40	8	AE
575	BAY AV	septic	8.75	15.99	8	AE
575	BAY AV	propane	3.45	15.99	8	AE
575	BAY AV	ac	5.35	15.99	8	AE
581	BAY AV	ac	7.76	6.97	10	VE
581	BAY AV	ac	6.64	6.97	10	VE
581	BAY AV	ac	7.06	6.97	10	VE
581	BAY AV	septic	5.43	6.97	10	VE
587	BAY AV	septic	8.07	8.74	8	AE
587	BAY AV	propane	6.97	8.74	8	AE
591	BAY AV	ac	4.74	7.64-15.49	8	AE
603	BAY AV	ac	4.33	9.95	8	AE
607	BAY AV	ac	5.00	5.01	10	VE
611	BAY AV	ac	4.34	3.52	8	AE
619	BAY AV	ac	6.64	15.94	8	AE
619	BAY AV	septic	7.41	15.94	8	AE
623	BAY AV	ac	4.63	14.41	8	AE
625	BAY AV	propane	5.68	6.60	8	AE
629	BAY AV	ac	7.29	16.24	10	VE
633	BAY AV	septic	4.06	7.35	8	AE
643	BAY AV	ac	6.16	6.88	10	VE
645	BAY AV	ac	6.81	6.67	8	AE
645	BAY AV	propane	6.15	6.67	8	AE
645	BAY AV	septic	7.47	6.67	8	AE
24375	BAY AV	septic	7.07			
24383	BAY AV	propane	3.59			
24383	BAY AV	septic	3.61			

House Number	Street Name	Inventory Type	Ground Elevation Below Inventory (ft)	Finished Floor Elevation	100 Yr Flood Elevation (ft)	FEMA Flood Zone
24397	BAY AV	septic	7.60			
24397	BAY AV	ac	5.98			
24397	BAY AV	propane	6.63			
24536	BAY AV	gas/oil	4.00			
24536	BAY AV	propane	3.97			
24536	BAY AV	ac	3.88			
24568	BAY AV	septic	6.18			
24603	BAY AV	septic	3.52			
24603	BAY AV	propane	3.16	16.52	9	AE
103	BEACH PLUM DR	septic	7.49	16.13	10	VE
107	BEACH PLUM DR	ac	8.31	16.84	10	VE
107	BEACH PLUM DR	septic	6.41	16.84	10	VE
107	BEACH PLUM DR	propane	8.29	16.84	10	VE
107	BEACH PLUM DR	septic	7.88	16.84	10	VE
109	BEACH PLUM DR	septic	9.83	7.38	10	VE
109	BEACH PLUM DR	ac	8.65	7.38	10	VE
110	BEACH PLUM DR	propane	5.07	14.08	9	AE
112	BEACH PLUM DR	septic	7.89	11.90	8	AE
112	BEACH PLUM DR	ac	4.39	11.90	8	AE
112	BEACH PLUM DR	propane	5.22	11.90	8	AE
112	BEACH PLUM DR	propane	5.36	11.90	8	AE
115	BEACH PLUM DR	propane	8.86	16.22	10	VE
117	BEACH PLUM DR	propane	9.23	20.77	10	VE
117	BEACH PLUM DR	ac	9.85	20.77	10	VE
120	BEACH PLUM DR	septic	7.22	15.63	9	AE
121	BEACH PLUM DR	ac	9.68	17.75	10	VE
121	BEACH	septic	9.23	17.75	10	VE

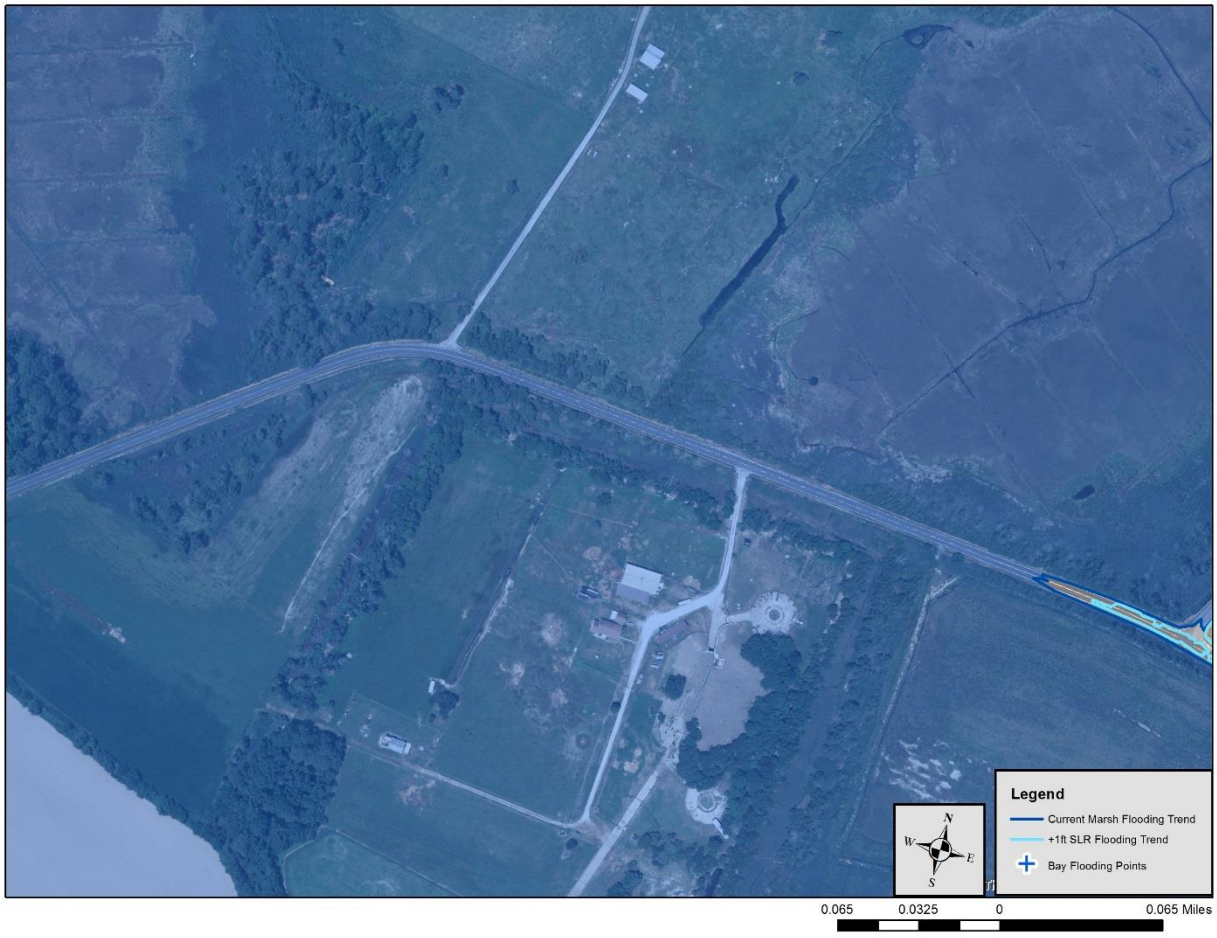
House Number	Street Name	Inventory Type	Ground Elevation Below Inventory (ft)	Finished Floor Elevation	100 Yr Flood Elevation (ft)	FEMA Flood Zone
	PLUM DR					
121	BEACH PLUM DR	propane	9.71	17.75	10	VE
121	BEACH PLUM DR	ac	9.64	17.75	10	VE
125	BEACH PLUM DR	septic	8.95	8.43	10	VE
128	BEACH PLUM DR	propane	5.70	12.33	9	AE
128	BEACH PLUM DR	septic	6.98	12.33	9	AE
128	BEACH PLUM DR	propane	6.07	12.33	9	AE
130	BEACH PLUM DR	propane	4.81	11.57	9	AE
130	BEACH PLUM DR	septic	4.56	18.25	10	VE
131	BEACH PLUM DR	septic	8.66	18.25	10	VE
133	BEACH PLUM DR	septic	11.48	16.10	10	VE
133	BEACH PLUM DR	ac	8.60	16.10	10	VE
132	BEACHPLUM DR	septic	8.58	12.88	9	AE
132	BEACHPLUM DR	ac	3.11	12.88	9	AE
109	DRIFTWOOD CIR	propane	6.56	11.90-13.70	10	VE
109	DRIFTWOOD CIR	ac	6.32	11.90-13.71	10	VE
111	DRIFTWOOD CIR	propane	5.50			
3537	LIGHTHOUSE RD	ac	8.61	5.54	10	AE
100	MARINA DR	septic	10.23	5.97-7.73	9	AE
100	MARINA DR	septic	9.56	5.97-7.74	10	AE
100	MARINA DR	ac	8.91	5.97-7.75	11	AE
100	MARINA DR	septic	9.32	5.97-7.76	12	AE
100	MARINA DR	ac	8.19	5.97-7.77	13	AE
100	MARINA DR	propane	7.43	5.97-7.78	14	AE
100	MARINA DR	septic	7.57	5.97-7.79	15	AE
100	MARINA DR	ac	8.56	5.97-7.80	16	AE
100	MARINA DR	propane	7.94	5.97-7.81	17	AE

House Number	Street Name	Inventory Type	Ground Elevation Below Inventory (ft)	Finished Floor Elevation	100 Yr Flood Elevation (ft)	FEMA Flood Zone
136	MARINA LN	septic	8.11	12.82	9	AE
100	PASSWATERS DR	ac	7.52	7.93-12.13	9	AE
107	SAND PIPER DR	propane	4.94	22.41	10	VE
107	SAND PIPER DR	well	5.03	22.41	10	VE
107	SAND PIPER DR	ac	8.48	22.41	10	VE
233	BAY AV			6.61	10	VE
253	BAY AV			7.51	10	VE
303	BAY AV					
325	BAY AV			15.84	10	VE
341	BAY AV			8.71	10	VE
347	BAY AV			8.43	10	VE
365	BAY AV			9.89	10	VE
366	BAY AV					
367	BAY AV			9.76	10	VE
388	BAY AV			5.98	8	AE
397	BAY AV			9.85	10	VE
401	BAY AV					
411	BAY AV			9.10	10	VE
419	BAY AV					
432	BAY AV			6.31	9	AE
434	BAY AV			6.33	9	AE
435	BAY AV			10.56	10	VE
436	BAY AV			5.10	9	AE
437	BAY AV			7.46	10	VE
444	BAY AV			6.47	9	AE
447	BAY AV			8.88	10	VE
457	BAY AV			9.77	10	VE
470	BAY AV			5.31	9	AE
478	BAY AV			4.58	9	AE
479	BAY AV			6.41	10	VE
493	BAY AV			9.09	10	VE
501	BAY AV			4.87	10	VE
513	BAY AV			10.41	10	VE
523	BAY AV			9.03	10	VE
537	BAY AV			14.53	10	VE

House Number	Street Name	Inventory Type	Ground Elevation Below Inventory (ft)	Finished Floor Elevation	100 Yr Flood Elevation (ft)	FEMA Flood Zone
541	BAY AV			12.87	10	VE
555	BAY AV			7.59	8	AE
561	BAY AV			15.07	8	AE
585	BAY AV			7.00	10	VE
599	BAY AV			7.08	10	VE
605	BAY AV			4.53	8	AE
609	BAY AV			5.81	8	AE
613	BAY AV			10.62	10	VE
615	BAY AV			7.81	8	AE
631	BAY AV			7.25	8	AE
639	BAY AV			7.56	10	VE
641	BAY AV			15.11	10	VE

Appendix B: Town of Slaughter Beach Flood Contour Maps

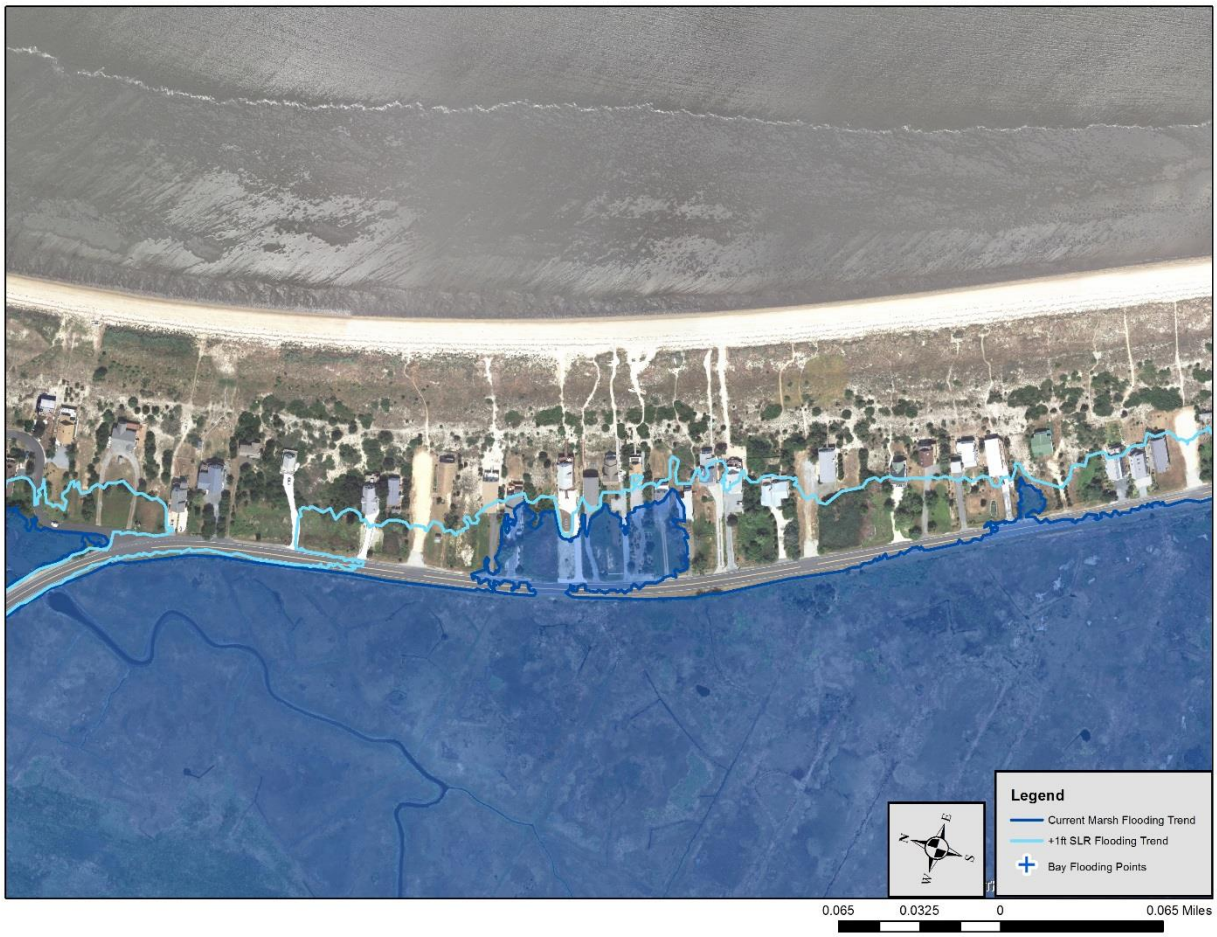
Cedar Beach Road



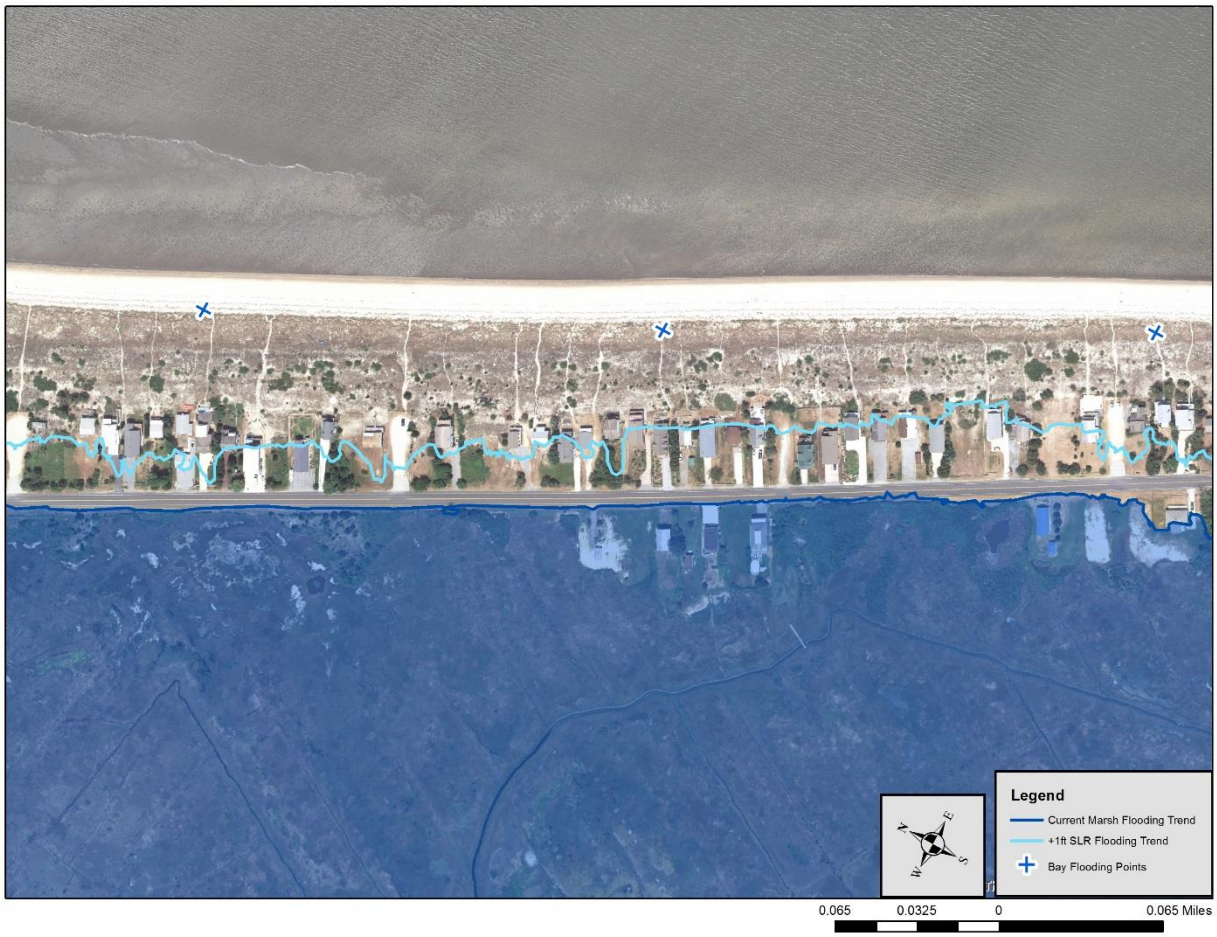
Cedar Beach Road Draw Bridge

Beach Plum and Passwaters Drive

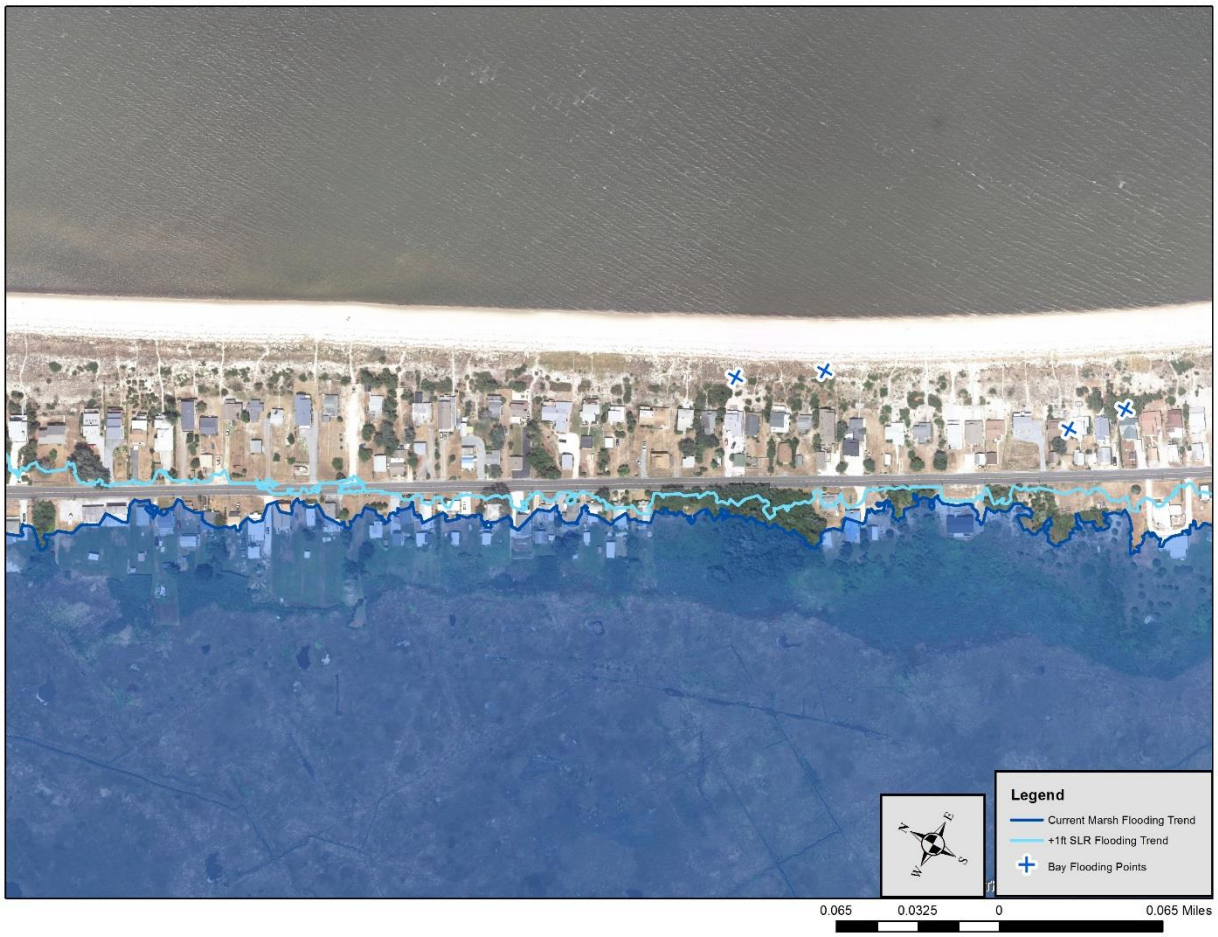
645 Bay Avenue – 573 Bay Avenue



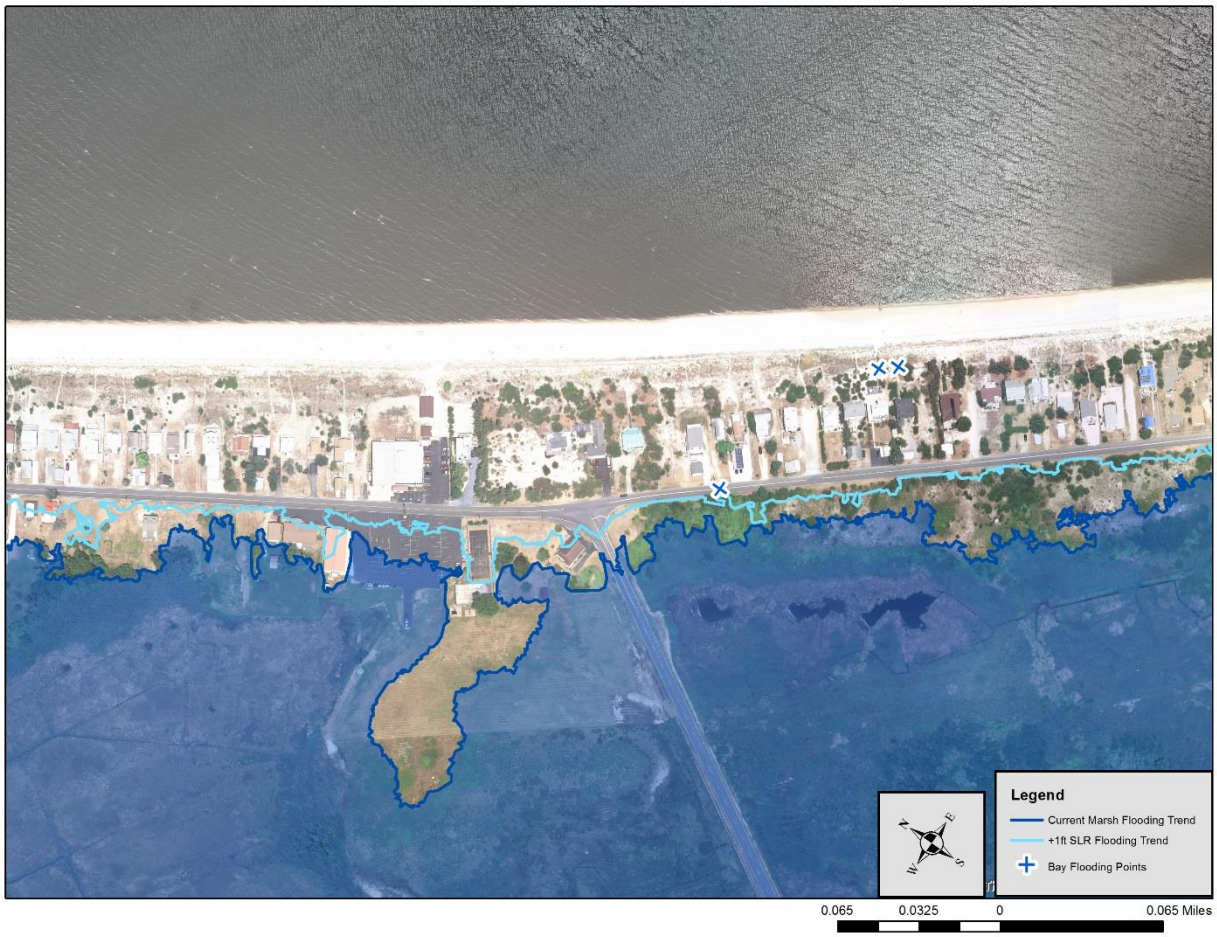
Cohee Drive – 495 Bay Avenue



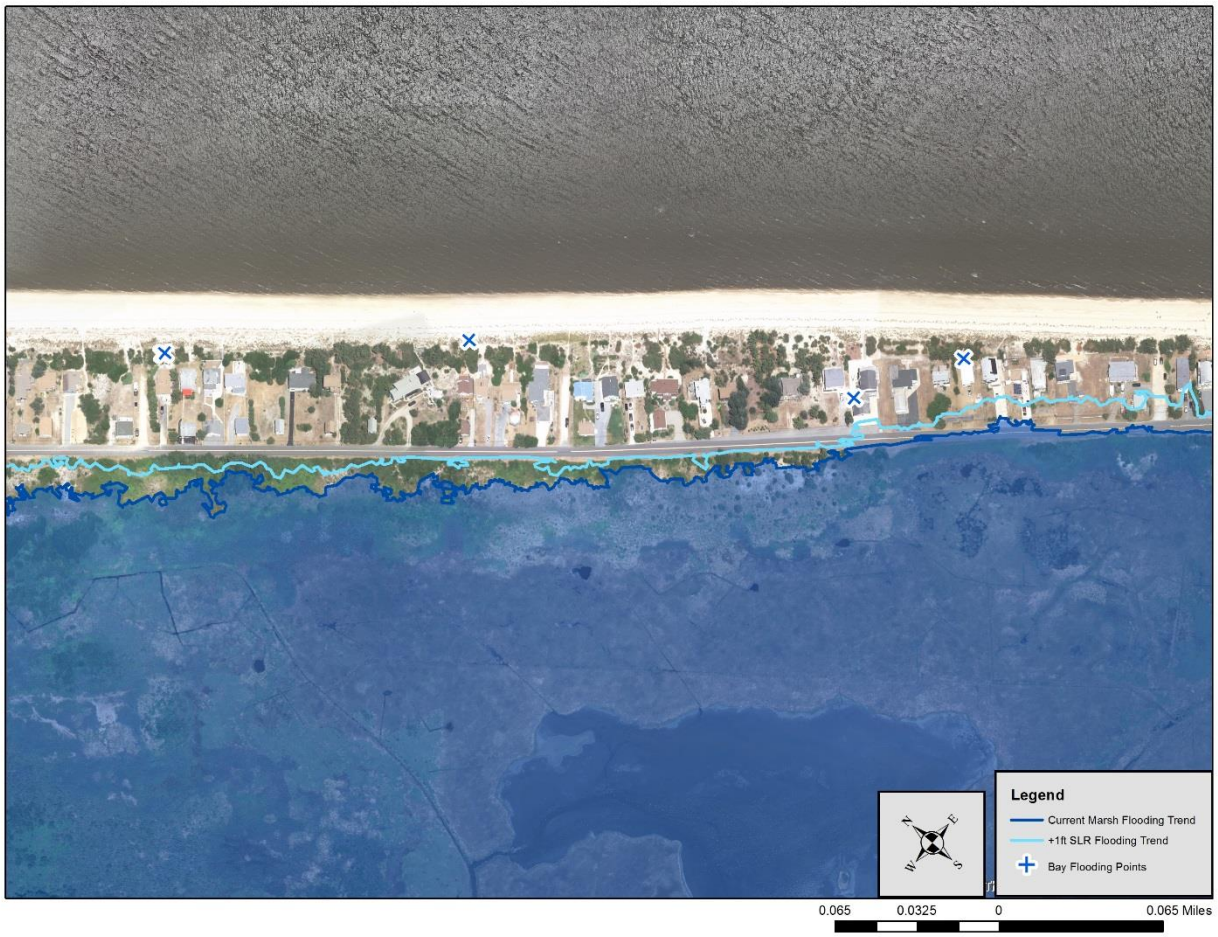
481 Bay Avenue – 403 Bay Avenue



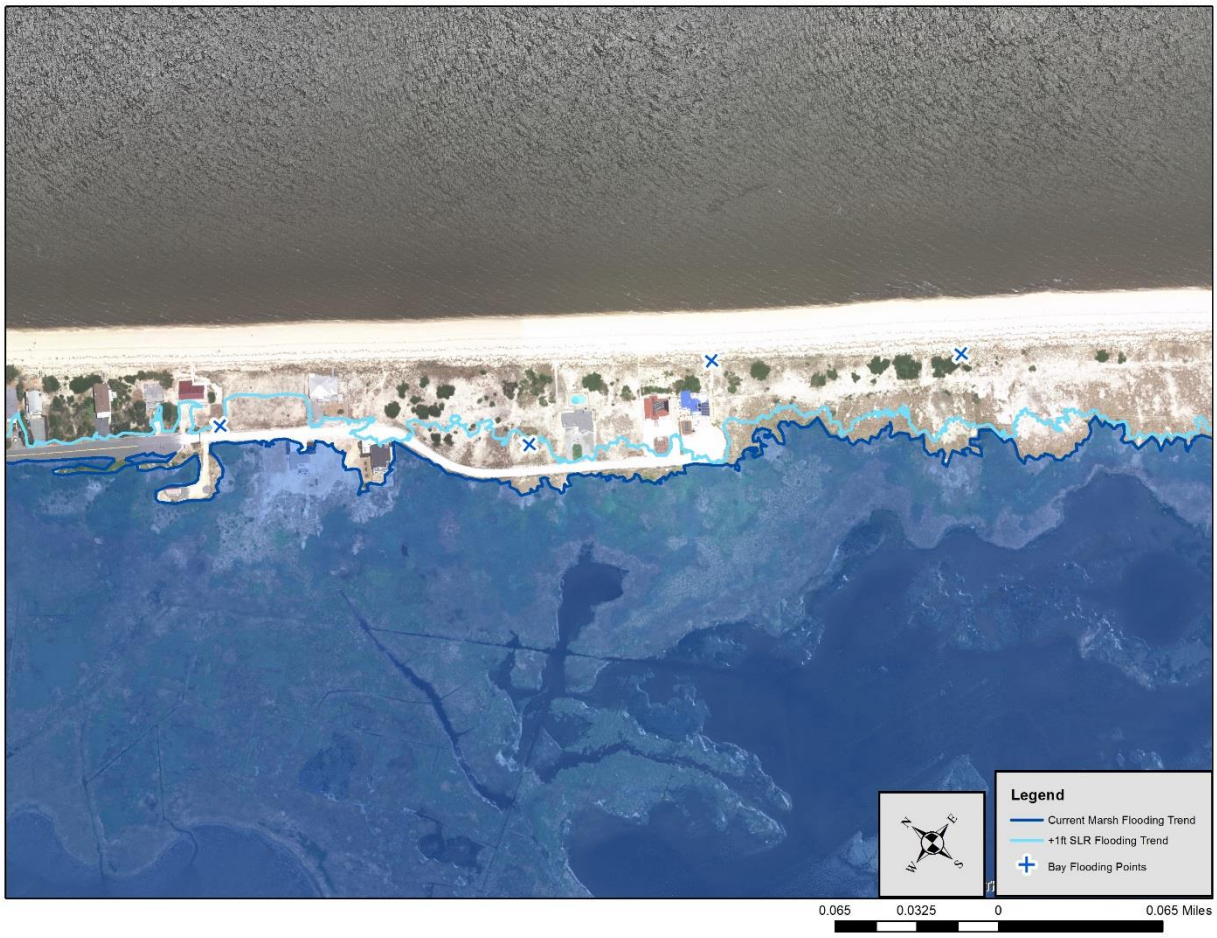
Bay Avenue and Slaughter Beach Road



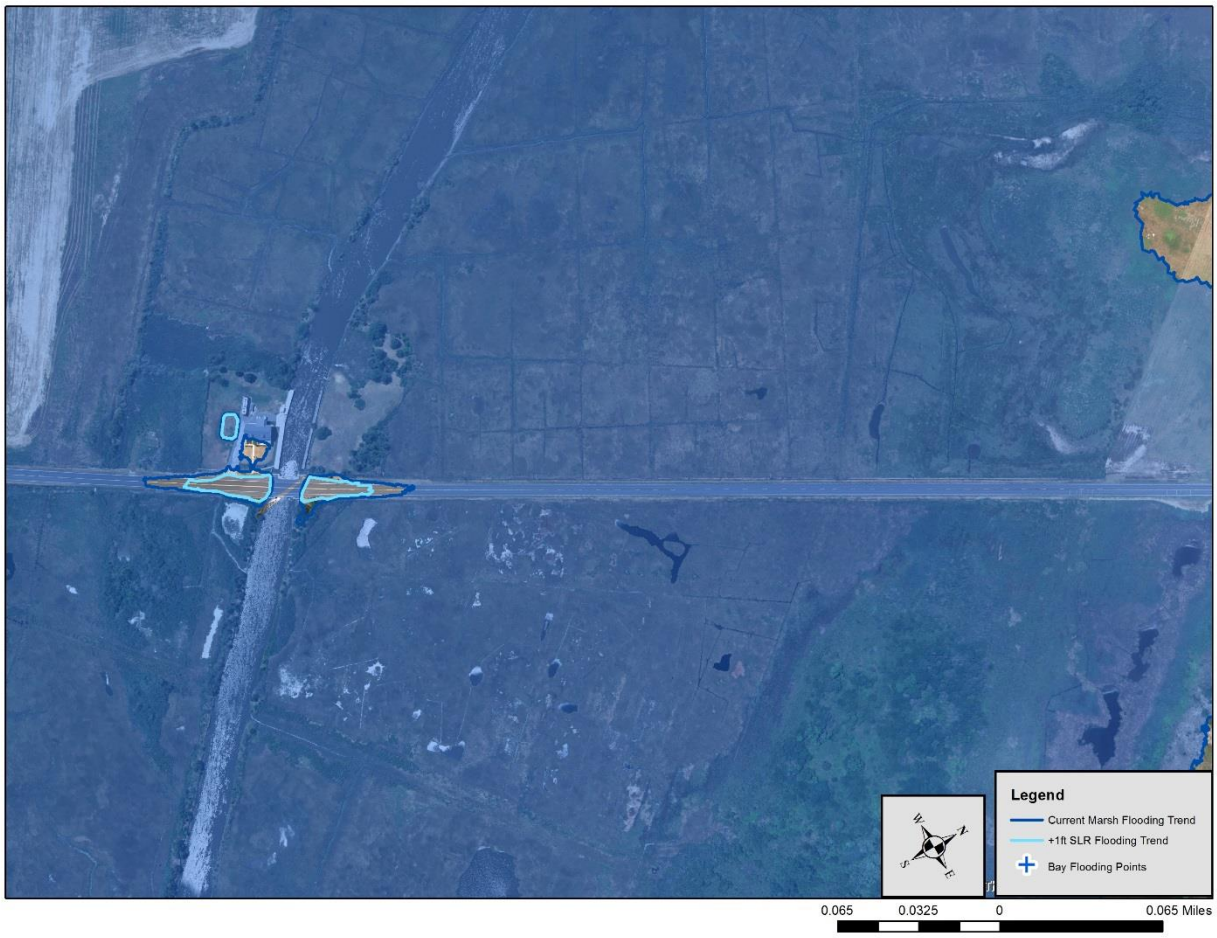
305 Bay Avenue – 213 Bay Avenue



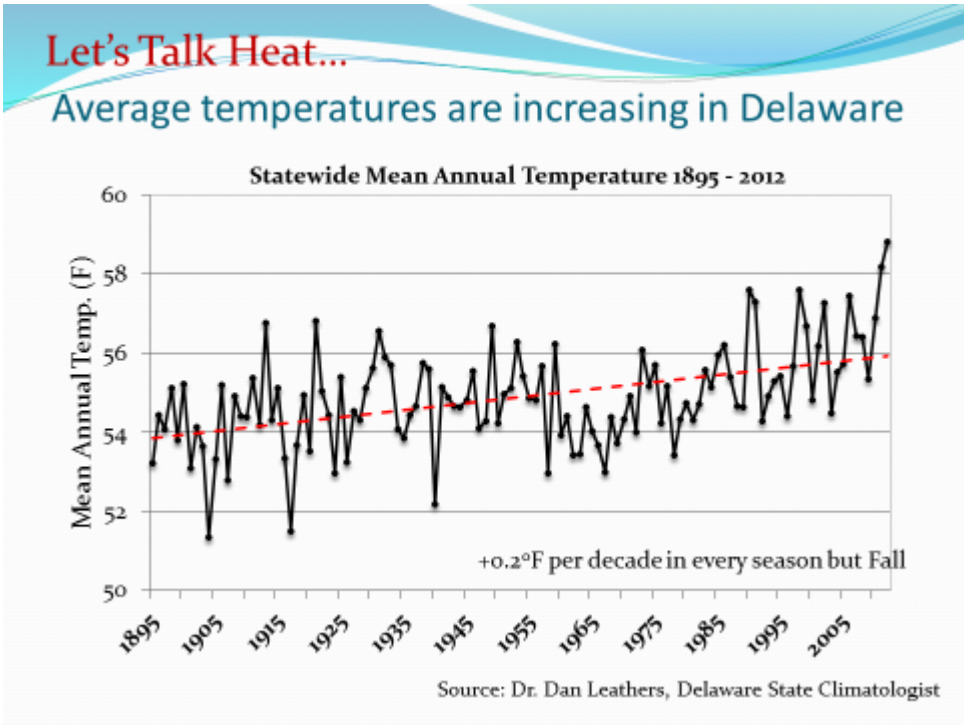
213 Bay Avenue – Isaacs Shore Drive

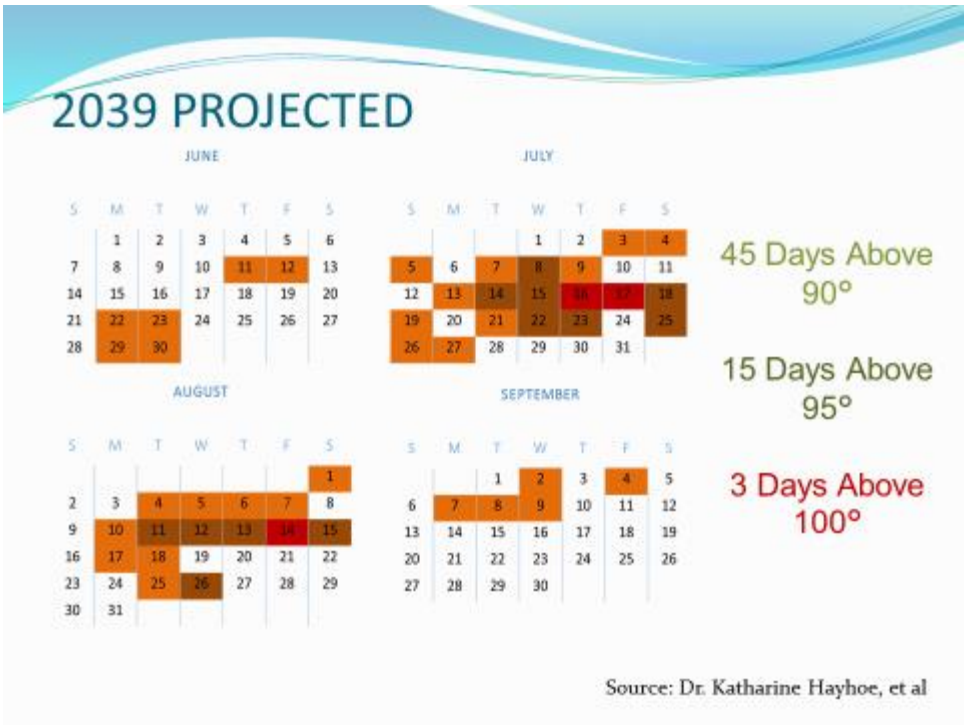


Slaughter Beach Road



Appendix C: Projected Excessive Heat Days in Slaughter Beach, Del.




2039 PROJECTED
JUNE
JULY
AUGUST
SEPTEMBER
45 Days Above 90°
15 Days Above 95°
3 Days Above 100°
Source: Dr. Katharine Hayhoe, et al


Have you or anyone you know been impacted by excessive heat in Slaughter Beach?
38%
62%
Yes
No

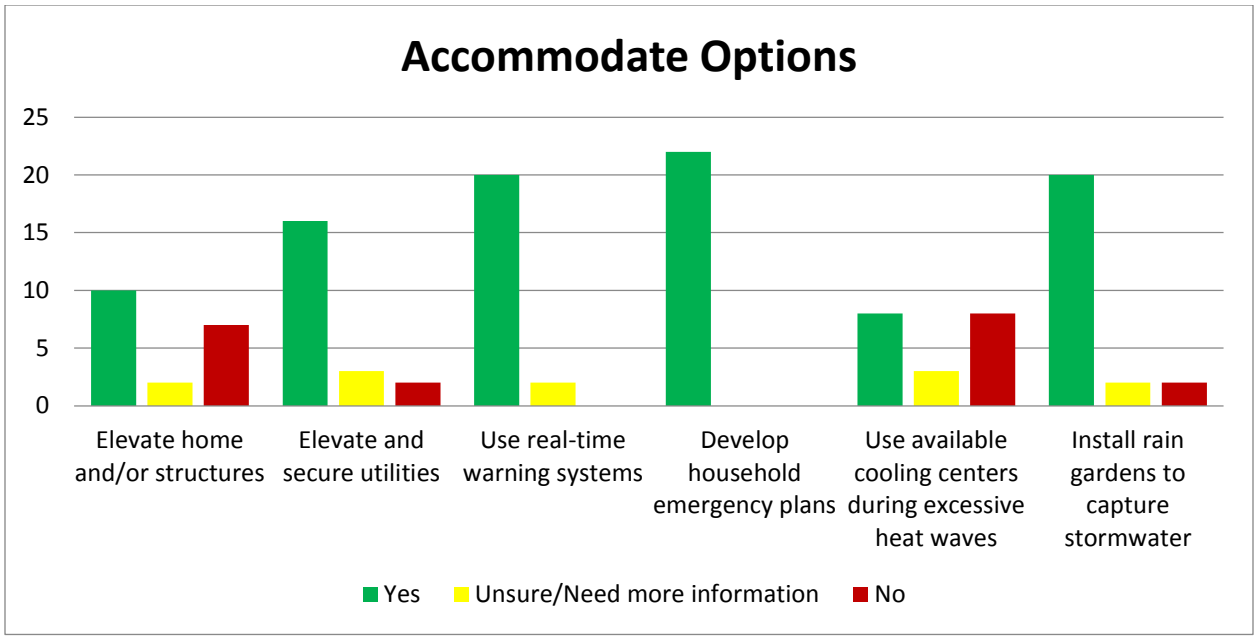
Findings:

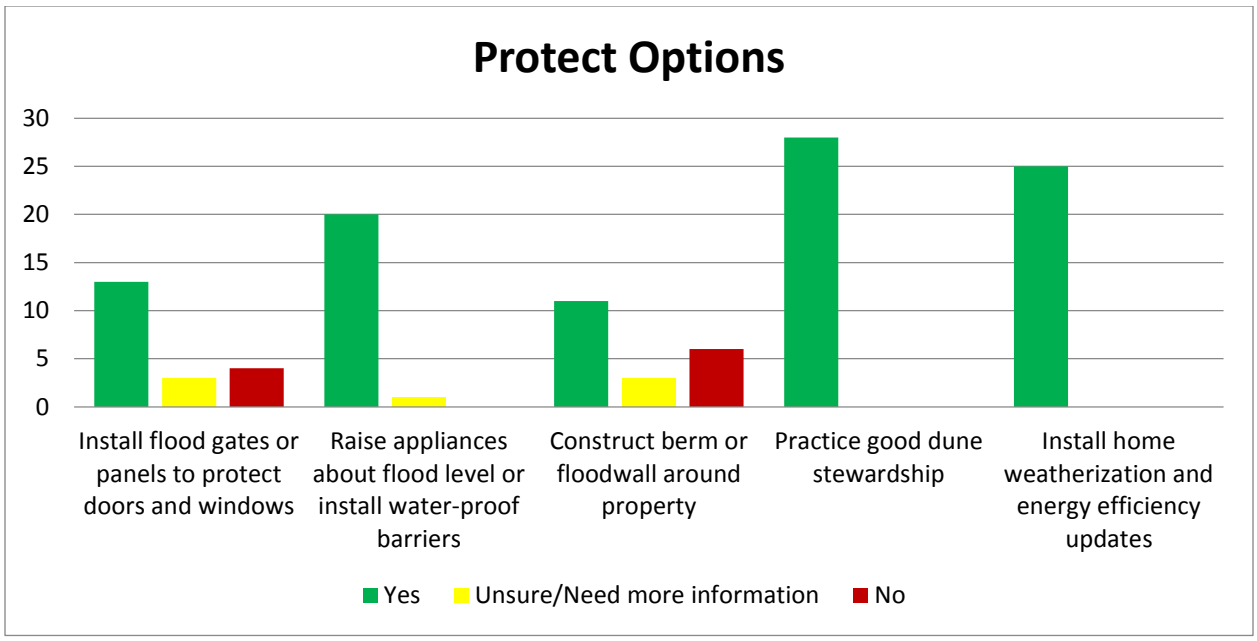
- The Town's aging demographics and lack of tree cover make it particularly susceptible to extreme heat in the future
  - **10.4% Tree Canopy**

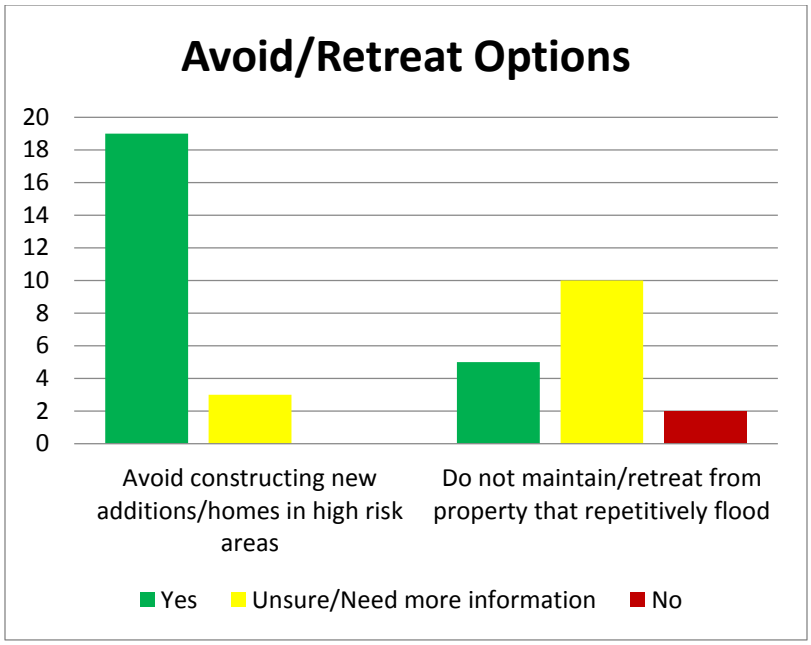
- 44% of residents surveyed do not have a plan to cope with the loss of power over an extended period of time

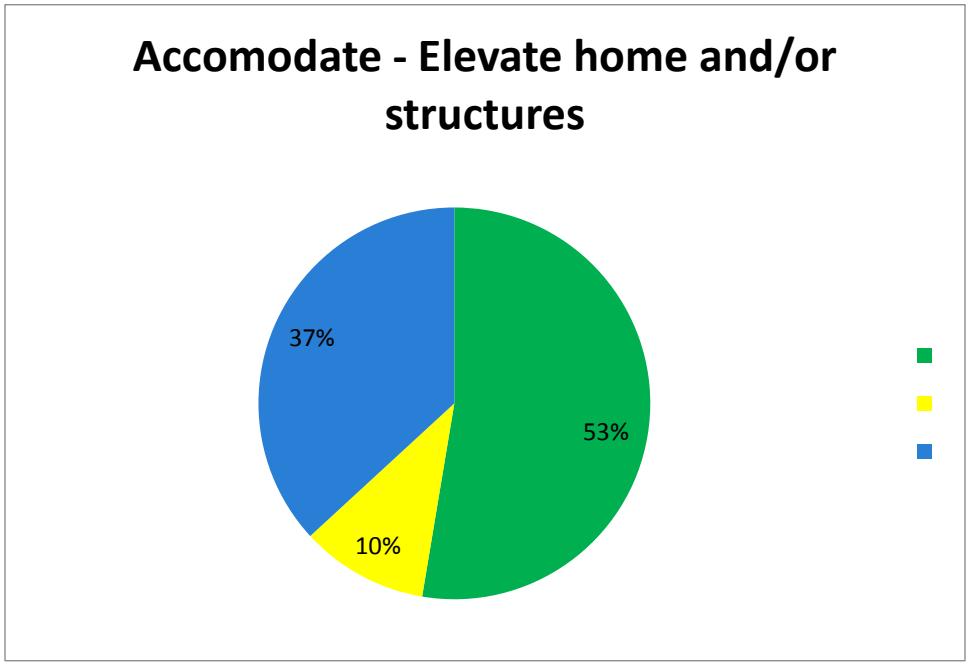
Appendix D: Slaughter Beach Homeowner Adaptation Options Sticky Dot Voting Results from October 8, 2016

"Within the next 20 years, would you consider using any of these adaptation options for your own property?"			
Accommodate	**Yes**	**Unsure/Need more information**	**No**
Elevate home and/or structures	10	2	7
Elevate and secure utilities	16	3	2
Use real-time warning systems	20	2	0
Develop household emergency plans	22	0	0
Use available cooling centers during excessive heat waves	8	3	8
Install rain gardens to capture stormwater	20	2	2
Other Ideas			
Protect	**Yes**	**Unsure/Need more information**	**No**
Install flood gates or panels to protect doors and windows	13	3	4
Raise appliances about flood level or install water-proof barriers	20	1	0
Construct berm or floodwall around property	11	3	6
Practice good dune stewardship	28	0	0
Install home weatherization and energy efficiency updates	25	0	0
Other Ideas			
Avoid/Retreat	**Yes**	**Unsure/Need more information**	**No**
Avoid constructing new additions/homes in high risk areas	19	3	0
Do not maintain/retreat from property that repetitively flood	5	10	2
Other Ideas			


Accommodate Options
25
20
15
10
5
0
Elevate home and/or structures
Elevate and secure utilities
Use real-time warning systems
Develop household emergency plans
Use available cooling centers during excessive heat waves
Install rain gardens to capture stormwater
Yes
Unsure/Need more information
No


Protect Options
30
25
20
15
10
5
0
Install flood gates or panels to protect doors and windows
Raise appliances about flood level or install water-proof barriers
Construct berm or floodwall around property
Practice good dune stewardship
Install home weatherization and energy efficiency updates
Yes
Unsure/Need more information
No


Avoid/Retreat Options
20
18
16
14
12
10
8
6
4
2
0
Avoid constructing new additions/homes in high risk areas
Do not maintain/retreat from property that repetitively flood
Yes
Unsure/Need more information
No


Accomodate - Elevate home and/or structures
37%
53%
10%